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July 2019
Issue 469

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Recover from any disaster

Essential Windows repair kit

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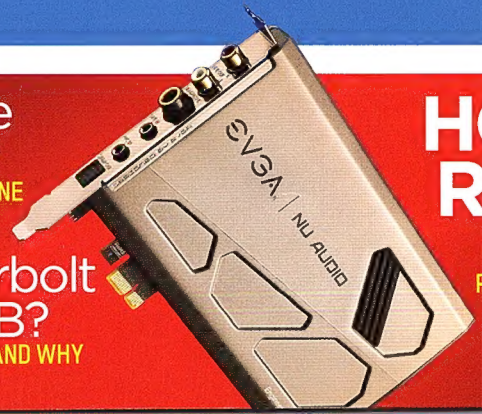
Thunderbolt or USB?
WHICH TO USE, AND WHY



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EVGA NU AUDIO

PLUS, DELL LATITUDE 7400 2-IN-1, INTEL H10 SSD, SYNOLOGY DISKSTATION DS1019+

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Vigor3900

Qaud-WAN Gigabit broadband router with Security Firewall, 500 x VPN tunnels, and 100 x SSL-VPN tunnels

Ethernet WAN NBN Ready | Ethernet WAN UFB Ready | 500x VPN | 100x SSL-VPN | TAIWAN EXCELLENCE 2012

- 4 x Gigabit Ethernet WAN ports
- 1 x SFP WAN port
- Multi-WAN Load Balancing & Failover
- 2 x Gigabit Ethernet LAN ports with 120,000 NAT sessions
- 1 x SFP LAN port
- 500 x VPN & 100 x SSL-VPN tunnels with Central VPN Management
- High Availability Mode
- Object-oriented Firewall with Content Security Management (CSM) and QoS
- IPv6 x IPv4
- Multi-subnet WAN/LAN through 802.1Q
- Bandwidth management
- 2 x USB ports for 3G/4G LTE mobile broadband access, USB printer, storage, and thermometer
- Support VigorACS 2 management system
- Smart Monitor Traffic Analyzer (up to 500 nodes)

Vigor3220 Series

Qaud-WAN Gigabit broadband router with Security Firewall, 100 x VPN tunnels, and 50 x SSL-VPN tunnels

Ethernet WAN NBN Ready | Ethernet WAN UFB Ready | 100x VPN | 50x SSL-VPN | TAIWAN EXCELLENCE 2016

- 4 x Gigabit Ethernet WAN ports
- 1 x USB port (USB3.0) support 3G/4G LTE mobile broadband access
- Multi-WAN Load Balancing & Failover
- 1 x USB port (USB2.0) support file sharing, external storage, network printer or thermometer
- 100 x VPN and 50 x SSL-VPN tunnels with Central VPN Management, Load Balance and Redundancy
- 1 x Gigabit LAN port with 100,000 NAT sessions
- 1 x Dedicated Gigabit Ethernet DMZ port for connecting servers
- 1 x Console port (RS232)
- Object-oriented Firewall with Content Security Management (CSM) and QoS
- IPv6 x IPv4
- 802.11n Wi-Fi for Vigor3220n
- Central AP Management
- Central Switch Management
- Support VigorACS 2 management system
- Smart Monitor Traffic Analyzer (up to 200 nodes)

Vigor2952P

Dual-WAN broadband Fibre router with Security Firewall, 4 x PoE LAN ports (power budget up to 60 Watts), 100 x VPN tunnels, and 50 x SSL-VPN tunnels

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- 1 x Gigabit Ethernet/SFP combo WAN port
- 1 x Gigabit Ethernet WAN port
- Multi-WAN Load Balancing & Failover
- 4 x Gigabit PoE Ethernet LAN ports with 60,000 NAT sessions
- Complies with 802.3at Power over Ethernet Plus
- Supports PoE power up to 30 watts for each port
- Total PoE power budget up to 60 watts
- 1 x USB port (USB3.0) support 3G/4G LTE mobile broadband access
- 100 x VPN and 50 x SSL-VPN tunnels with Central VPN Management, VPN Load Balance and Redundancy
- High Availability Mode
- Object-oriented Firewall with Content Security Management (CSM)
- IPv6 & IPv4
- Comprehensive QoS features
- Multi subnet WAN/LAN through 802.1Q
- 1 x USB port (USB2.0) support file sharing, external storage, network printer or thermometer
- Central AP Management
- Central Switch Management
- Works with VigorACS 2 management system
- Smart Monitor Traffic Analyzer

i-LAN TECHNOLOGY

i-LAN Technology Pty Ltd trading as DrayTek Aust & NZ

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Photography
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Printed by Blue Star PRINT (NSW)

Distributed in Australia and NZ by Gordon and Gotch
www.gordongotch.com.au

ISSN 0728-441

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Red vs Blue vs Green

The PC hardware wars are back. It's about time.

It sure has been wild watching AMD shake up the CPU scene over the last two years since Ryzen landed. Intel's full response is still taking shape, with its sub-14nm process just about ready for prime time. We will see big news out of Computex from Intel, where major announcements are expected. We're off to the big annual show as this issue goes to print, and will give you a full report next month, covering what AMD and Intel are bringing to battle – and to your next PC, perhaps.

What we do know is that AMD will announce the first 7nm Zen 2 CPUs, and they're expected to increase both core count and frequency in the 3rd-generation Ryzens. Intel will almost certainly counter with new 10th-gen Core CPUs built around the Ice Lake architecture, probably in the same week. I can't wait to come back and share my impressions with you. Chris Szewczyk will be there with me, and together we'll be seeing everything Computex has to offer, talking with the key players and putting it all together for a major feature next month.

And, just a week after we're back from Computex, Chris is jetting off to cover an AMD event in LA. What that's all about I can't say, but while we're talking AMD the company is expected to announce its next GPU very soon. 'Navi' has been the subject of speculation and rumours and has made frequent appearances on official AMD roadmaps since 2016. What will probably be cheekily named the 3000 series (there will be a 3070, 3080 and probably 3060, too) shows the sort of brazen marketing confidence that has defined AMD since Ryzen. If you thought Ryzen did great things for the CPU market, just wait until we see Navi's impact on GPUs... and most especially, Nvidia's response.

Exciting times, indeed! If the rumours about Navi's pricing are true – and we will know very soon – then Nvidia will be forced to react in exactly the same manner Intel did when Ryzen hit. It's all working for AMD, with it recording market share growth in desktop CPUs of around 5% a year. Relatively small numbers, yes, but perceptions take a long time to change in the mainstream, and longstanding system builder partnerships move at even slower speeds.

Still, there's a sense of excitement throughout the industry. There's plenty of room in the market for all involved to be successful. It makes for terrific fun for us to report and you to read. See you next month!

BEN MANSILL
EDITOR
ben.mansill@futurenet.com

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ISSUE 469, JULY 2019

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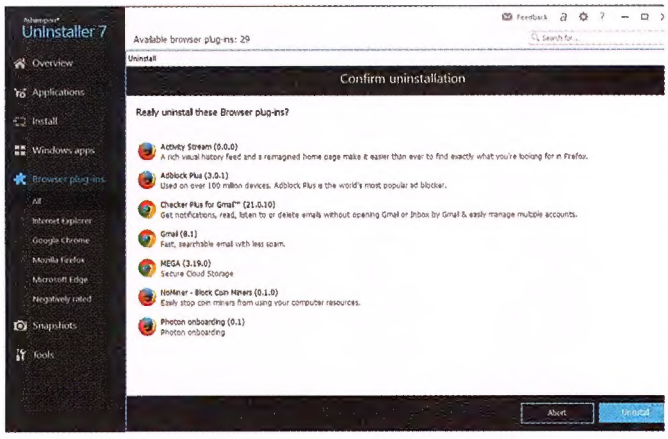
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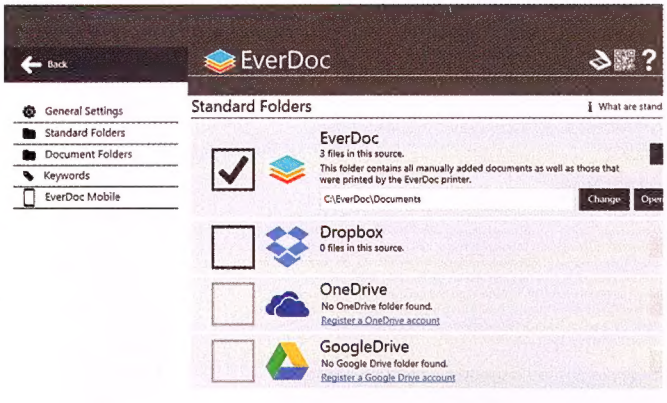

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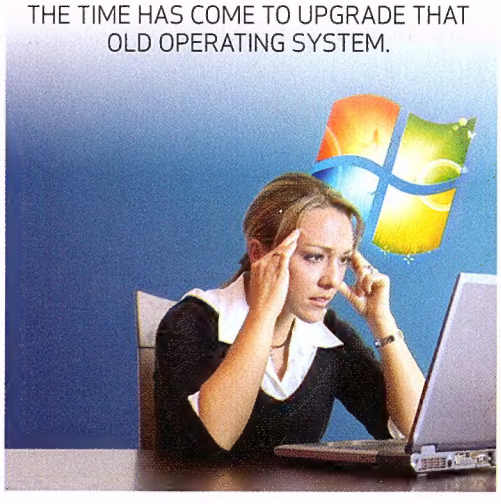

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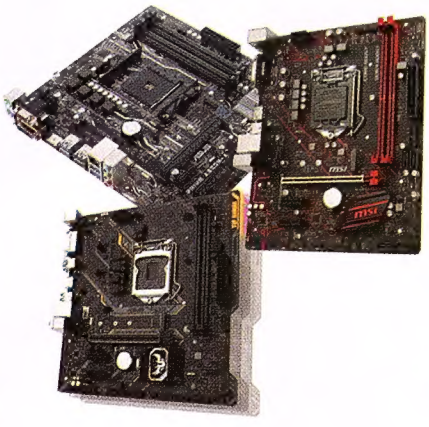

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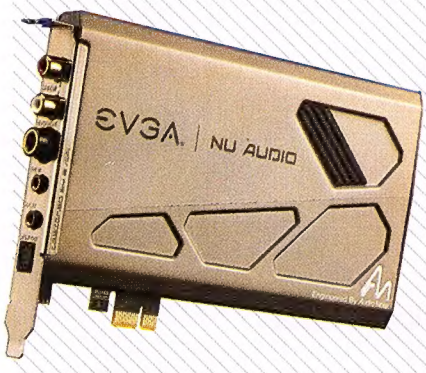

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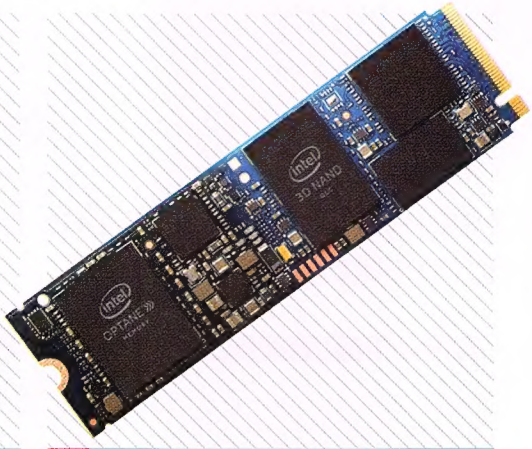

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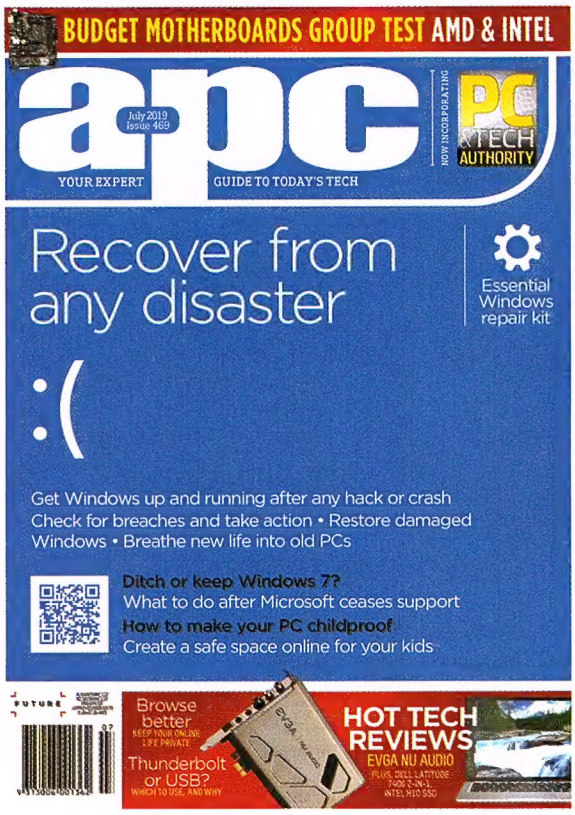
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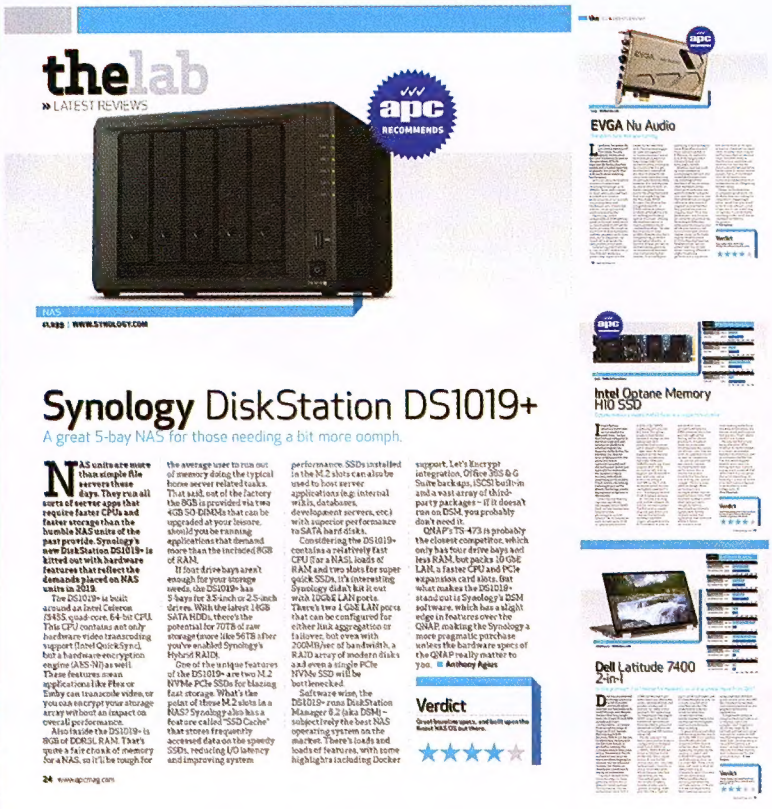

Inside APC

Find out all about *APC*'s editorial policies, test practices, how to read the benchmark results, and more.

APC is Australia's oldest consumer technology magazine – having been consistently in print for over 35 years, since our first issue way back in May 1980 – and we take that heritage and responsibility very seriously. While our focus is obviously on the personal computer – it's in our name, after all – the very definition of the PC has changed and shifted markedly since the early 1980s. As such, we touch on many other areas of tech, too, from smartphones and apps to peripherals, accessories, online services and beyond. We have two main goals: to track down the best of modern tech and also to help our readers make the most of it.

We're also an open church in terms of platforms. We know most people aren't wed to a single brand's products and use a variety of devices. And, like you, *APC*'s journalists want to know what's good in tech – no matter what platform it resides on.

INDEPENDENT REVIEWS

Championing technology doesn't mean we're unrelenting yes-men and -women, however, and *APC* aims to be as objective as possible in all our coverage. That means identifying the best products from multiple perspectives – the best performance, best value and best features and, ideally, the products that offer the best mix of these three.

As a matter of policy, reviews published in *APC* are not shared with product-makers prior to print. We will contact vendors under certain conditions; for example, if we have a problem testing a product that seems to indicate it may be faulty, or to invite a vendor to clarify how a particular feature works. If an *APC* reviewer has any potential conflicts of interest involving a brand, the review will always be assigned to another writer.

LABS TESTING

Despite being a small magazine with limited resources, *APC* still strives to conduct the most rigorous, objective scientific tests and benchmarks we can so as to make our reviews as unbiased as possible. We use a variety of tools and programs for this, including many freely available benchmark suites for assessing media encoding, general system performance, gaming and battery life.

In most cases, for the benchmark results published in *APC*, you can assume that higher is better. There are certain tests that deviate from this rule where the opposite is true; in those cases, we've flagged the results with a note explaining as such.

We use both tables and graphs for displaying results; the latter are our preference due to their ease-of-readability, but tables are more compact, so we use these in cases where thoroughness is preferred.

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» HARRY DOMANSKI & SHARMISHTA SAKAR DIVULGE THE NEED-TO-KNOW TECH NEWS

FttN NBN users may be upgraded to a faster technology

BUT ONLY IF NEW TRIAL PROVES SUCCESSFUL.

The government wants to ensure that the entire NBN network is capable of achieving peak speeds of 25Mbps, but according to tests, only 1.3% of fibre-to-the-node customers are able to hit that mark. In a bid to increase broadband speeds, NBN Co will trial upgrading selected FttN users to fibre-to-the-curb or fibre-to-the-premises connections. If successful, the NBN could lay out an upgrade strategy for its FttN footprint, which could include using access technologies like G.Fast and G.mfast. SS

News aggregator Flipboard suffers intrusion

150 MILLION USERS' DETAILS AT RISK.

News aggregator Flipboard has had to reset millions of users' passwords following several hacks over a nine-month period between June 2018 and April 2019. The hackers stole usernames, email addresses, passwords and account tokens for third-party services, although "not all" users' information was involved. Flipboard has refused to reveal the extent of the damage, but has a total of 150 million users. SS

Aussie student who hacked Apple just wanted a job

SENTENCED TO NINE MONTHS PROBATION.

The young Melburnian who hacked Apple twice says he only did it to get the Cupertino firm's attention – all he wanted was a job with the company. He'd heard that Apple had hired a European who attempted the same thing but, instead, the Aussie was reported to the FBI. The Apple fanboy plead guilty to the charges but won't be convicted. He's been let off the hook on a AU$500 good behaviour bond for nine months. SS

Australia's encryption laws allow police to snoop on public Wi-Fi users

LOCAL BUSINESSES REQUIRED TO HAND OVER CUSTOMER INFORMATION.

According to a briefing by the Home Affairs Department, users who access the internet at McDonald's and Westfield in Australia could be targets for surveillance by police. This news was obtained through a freedom of information request, which also reveals that police can compel businesses that offer free Wi-Fi access to patrons to hand over customer information. Under Australia's new Telecommunications Access and Assistance Act – which raised plenty of eyebrows when it passed through Parliament last year – authorities will have the power to compel cooperation from "designated communications providers" but, in reality, "any Australian retailer who offers a mobile phone application for online shopping or offers an application for mobile viewing" could be required to assist in police spying.

The briefing also provided several examples of the type of assistance authorities can lawfully ask for, like having a social media company help to automate the creation of fake accounts, a mobile carrier increasing a user's data allowance so surveillance methods don't eat up all of their data, forcing a device to send messages as an unencrypted SMS, and a data centre providing access to a customer's server rack to install a surveillance device. SS

Huawei banned from having dealings with US companies

ARM AND WIFI ALLIANCE FOLLOW GOOGLE'S FOOTSTEPS AND BANS THE CHINESE TECH GIANT.

Smartphone maker Huawei has found itself caught in the middle of a trade war between the US and China, with the Trump administration placing the tech giant on an Entity List, limiting the amount of business American companies can conduct with it. This has global implications – not just for Huawei, but its customers as well. Google was the first to impose a ban on the Chinese giant, rescinding Huawei's Android licence. This was followed by UK chipmaker ARM, which has ceased all business with Huawei for fear of US sanctions. Although the US Commerce Department has issued a temporary licence for Huawei to wrap up its business in the US, other organisations are following suit. Governing bodies like the WiFi Alliance and SD Association have ejected Huawei from their midst, meaning Wi-Fi, Bluetooth and NFC functions on Huawei smartphones could be affected. The company doesn't seem to be fazed, however, stating that all devices currently in the wild will continue receiving security updates and will not lose access to Google services either. In the meantime, Huawei says it developing its own smartphone operating software and app store. SS

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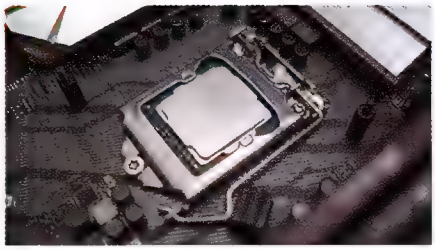


Intel mitigations impact its chipsets 5x more than the losses suffered by AMD

ALTHOUGH IT'S BEING COY ABOUT THE NUMBERS.

It seems we can't go more than a month without a new wave of crippling x86 CPU vulnerabilities being discovered. While Intel has been doing its best to patch them all (including the new Fallout, Zombieload and RIDL), the performance impact does appear to be stacking up. The effect may be more pronounced than Intel's letting on, too, with Linux publication *Phoronix* conducting its own tests, showing average performance declines of 16% on Intel chips versus just 3% on AMD. And, if you disable hyper-threading – as is suggested after this new round of threats – that hit can be as high as 50%, according to *Phoronix*'s testing. Yikes. **HD**

After a brief slump, AMD has re-entered the Fortune 500

THANK YOU ZEN!

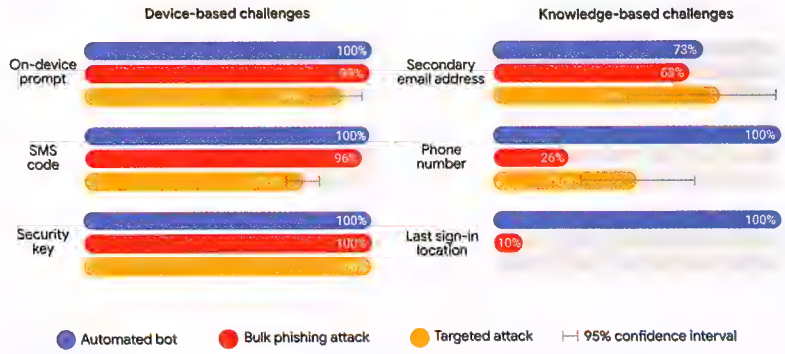
Fortune magazine's list of the 500 largest US corporations by revenue has officially re-entered AMD into the esteemed hierarchy at #460, after dropping off the radar in 2015 following a 26 year run. It's Zen processor microarchitecture is largely responsible for the return to prominence, bringing the company back from the brink of bankruptcy. **HD**

You won't need to use the Microsoft Store to install Windows 10 apps in the future

IS THE OS-MAKER DISTANCING ITSELF FROM THE STORE?

The Microsoft Store, which was once the only way to install UWP (Universal Windows Platform) apps, hasn't been the success that Microsoft hoped it would be, and it's now confirmed that you soon won't need it for this purpose. UWP apps have the benefit of security and performance certification from Microsoft, although critics argued that the Microsoft Store was too limiting a service for such an open platform as the PC. **HD**

Account takeover prevention rates, by challenge type



Google proves that recovery numbers are crucial for account security

NEW RESEARCH GIVES US THE NUMBERS ON ACCOUNT SECURITY.

Google's Security Blog has published research on the effectiveness of "basic account hygiene", finding that "simply adding a recovery phone number to your Google Account can block up to 100% of automated bots, 99% of bulk phishing attacks, and 66% of targeted attacks that occurred during [the] investigation". The blog post details the automatic account security measures that Google employs – these include 'knowledge-based challenges' such as verifying the last sign-in location of your device, the associated phone number and secondary email addresses.

While these weaker challenges prove successful in blocking most automated bot attacks, they are significantly less effective against both bulk phishing and targeted attacks. However, 'device-based challenges' thwarted almost every automated or bulk phishing attack that was thrown up against it, and performed considerably better against targeted attacks. These challenges include sending an SMS code or an on-device prompt to your associated mobile device, or alternatively using a designated security key such as YubiKey or Google's own Security Key, which was the only method tested that had a 100% prevention rate across the board. **HD**

Huawei founder doesn't want China to ban Apple's iPhones or MacBooks

PROTESTING THE POTENTIAL RETALIATION TO HUAWEI'S OWN US BAN

In response to the US Huawei ban (see opposite), there's been speculation about how China could respond, but one person at least doesn't think the country should retaliate in kind. In an interview with Bloomberg via translator, Huawei founder Ren Zhengfei said he would protest if China were to impose a similar ban on Apple's US-made devices in China. "That will not happen," Zhengfei responded. "If that happens, I'll be the first to protest. Apple is the world's leading company. If there was no Apple, there would be no mobile internet. If there was no Apple to help show us the world, we would not see the beauty of this world. Apple is my teacher – it's advancing in front of us. As a student, why should I oppose my teacher? I would never do that."

Less than a year ago, Huawei overtook Apple to become the world's second biggest smartphone maker behind Samsung, although recent events could shake up that ranking once again. **HD**

AOC

Experience Incredible Clarity and Increased Productivity

4K ULTRA HD

The 4K UHD (Ultra High Definition) screen, at 3840 x 2160 resolution, displays four times more pixels than the current Full HD industry standard, to provide incredibly detailed images with greater clarity.

CLEAR VISION

The Clear Vision image performance engine setting through the OSD menu can dynamically upscale Standard Definition (SD) sources to High Definition (HD), allowing you to view classic image and video content with sharper detail.

SCREEN +

Screen+ Software for Windows snaps different application windows into separate panels, with multiple monitor support. Multitasking, viewing and switching between windows becomes simpler and more organized.

SUPER COLOR

AOC Super Color technology enlivens the viewing experience with more passionate reds, enchanting greens and soothing blues. With this hardware solution, you can enjoy better color accuracy and true-to-life color reproduction in your photos, videos and more.

PICTURE-IN-PICTURE

Picture-in-Picture and Picture-by-Picture allow you to simultaneously view live input from a second device on a section of the screen (e.g. computer, home theatre player, game console, etc.).

LOW BLUE MODE

AOC Low Blue Mode protects the long term health of your eyes by reducing harmful short wavelength blue light, without sacrificing colour accuracy.

FLICKER FREE

Flicker Free technology can reduce eye strain, regulating backlight brightness without the constant flickering common to traditional monitors.

USB 3.0

Easily transfer data and files at super high speeds – including photos and even movies at ten times the speed of the common USB 2.0.

https://au.aoc.com/

techbrief

» SHARMISHTA SARKAR TAKES A DEEPER LOOK WHAT'S TRENDING IN TECH.

Browse better: keeping your online life private

Don't bite into these cookies.

Google's Chrome is by far the most popular web browser, but it's been developed by a company whose business runs off the back of data it collects from its users. And although Google updates Chrome regularly, the features always seem designed to dig deeper into your online life. However, Google is taking steps to improve online privacy on Chrome, announcing the changes coming to the browser at its recent developer conference. Going forward, Chrome will sport better cookie controls to limit online ad tracking by preventing cross-site cookies from working across sites and letting them travel over more secure HTTPS connections. While Google is making Chrome safer, it isn't the most private browser. For that, you'll need to look elsewhere, and we're taking this opportunity to list some of the best private browsers, and the worst one of them all (and, no, Chrome doesn't feature in our round-up).

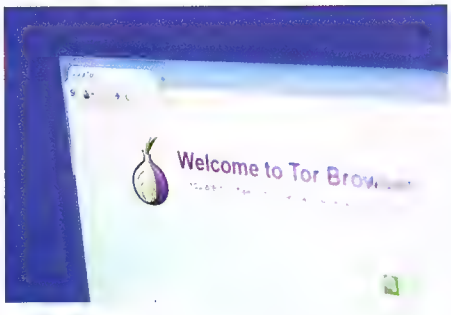
Chromium-based familiarity: Epic Privacy Browser

Made in India.

Anyone familiar with Chrome will be at home with Epic. This Chromium-based privacy browser doesn't allow plugins, blocks third-party cookies, detects and blocks ad networks, and stops analytics systems from tracking your online activity. Epic also blocks web RTC calls, which could leak your IP address. However, Epic's extreme privacy protocols means you won't be able to use browser extensions, there's no spell check, no autofill options or password saving. When an Epic window is closed, all history, media cache and login data is automatically deleted.

The safest bet on desktop: Tor Browser

This onion won't make you cry.



If you're looking to surf the interwebs anonymously, your safest bet without paying for a VPN is the Tor Browser. While a number of websites block Tor users, it has become the go-to browser for people living and working under authoritarian regimes. Tor features a three-layer proxy – hence the name 'the Onion Router' – that makes the traffic bounce from a publicly listed node, through a randomly chosen relay, to then make its way to the final exit. This randomness sometimes brings up web pages in a different language as there's no way to guess the user's IP address, but it's also what makes Tor the most private browser.

Fast, secure and privacy-focused: Brave

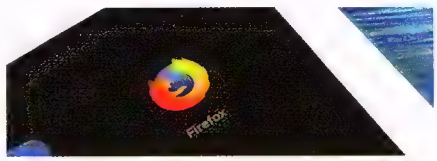
The lion with the brave heart.

Brave is also Chromium based and ships with a built-in ad blocker and the best out-of-the-box privacy settings there are. That makes Brave one of the more popular privacy browsers currently available for download. While Brave may have gotten rid of all ad trackers, there's no way to remove ads within search results; for example, you'll see AdWords adverts if you use Google Search. That said, the ability to remove ads also makes Brave faster than most browsers that don't use ad blockers. Brave is run by a team that put user privacy above all else, with the company promising it will never store user data on their servers.

The worst of the worst: Internet Explorer

Yes, it still exists and people use it.

Gone are the days when Microsoft's Internet Explorer (IE) was the go-to web browser – in fact, the company behind the browser is urging people to not use it and is currently working on a new Chromium-based Edge browser to replace it. Microsoft makes no guarantees that IE will keep your online live private. With hardly any security updates being pushed through for IE, it's one of the least secure browsers. While IE allows users to send Do Not Track requests to sites visited and to third parties that offer content on those sites. Those requests, though, can be ignored.



An all-round hitter: Mozilla Firefox

Keep it private from desktop to mobile.

Out of the box, Firefox on desktop isn't as secure as any of the best options we've mentioned on this page, but you can customise it. Being open source, Firefox can be audited by a third party, so Mozilla isn't cutting corners with its browser – so you get strong privacy protection and darn good security. With the added benefit of supporting plugins, Firefox is gaining in popularity. Moreover, Firefox Focus, the Android version of the browser, is one of the best mobile browsers for those concerned with privacy. As soon as the browser is closed, all personal information – passwords, browsing history and cookies – are immediately deleted. Plus it blocks ads and stops cross-site tracking. ■

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» GEAR WE WANT

SEAGATE BACKUP PLUS ULTRA TOUCH

The 'Touch' in the name means it feels good.

$139 | SEAGATE.COM.AU

We do commend Seagate for continually figuring out new ways of making portable hard drives somewhat interesting. This one has a cloth backing on one side of it. So, for something that is a data tool there's no denying it's a little bit fancy. On the practical front it includes both password protection as well as 256-bit hardware encryption, which you can apply on a per-folder basis if you like. It benched at just a nose past 120MB/s, both read and write, in line with portable hard drive expectations. Locally, only the 2TB model is available, with the 1TB model missing our shores.

AMAZON ECHO INPUT

Turn your favourite speaker into an Alexa device.

$55 | WWW.AMAZON.COM.AU

Amazon Alexa has taken off in a big way since launching in Australia last year, with the online retail giant offering a number of smart speakers among its rapidly expanding range of products. But what if you already have a perfect hi-fi setup or 'dumb' speaker in your home? Enter the Echo Input. Essentially an Echo Dot without the speaker part, Echo Input brings Alexa functionality via 3.5mm audio cable or Bluetooth, allowing you to use your voice to control music, check the weather, control your smart home and more. At a very reasonable $55, it's easily the most affordable way to hop aboard the Alexa train.

XAOMI HUAMI AMAZFIT STRATOS 2

A round the clock smartwatch.

$259 | EN.AMAZFIT.COM

The Amazfit Stratos is a big 4.5cm smartwatch offering advanced bio-physical tracking across 16 different activities. Its standout feature is a generous battery life that lasts up to five days under moderate usage conditions, or 35 hours using continuous GPS-enabled fitness tracking, for activities like marathons. This longevity comes from a large but less power hungry 1.34-inch transflective colour LCD screen that, sadly, lacks the vibrancy of an AMOLED screen. This dull demeanour is somewhat made up for by a clever etched bezel that makes it look like a slick dive-watch, and the 5ATM water resistance, sub-60g weight and VO2 Max tracking make it well worth the $259 price it typically sells for on Amazon AU.

EVOLVE GTR SKATEBOARD

Supercharged skating just got smoother.

FROM $1,629 | WWW.EVOLVESKATEBOARDS.COM.AU

This homegrown skateboard company has been making electric boards for a decade now, but the new GTR range that launched in May has been rebuilt from the ground up, reengineering everything from the motor to the connected app interface. The new GTR boards are powered by a 14AH Samsung Li-Ion battery that'll give you a range of up to 50km when using hard street wheels, or up to 30km with 7-inch pneumatic all-terrain wheels. The dual 1500-watt high-performance motors provide enough torque to drag you up hills with a 25% incline, or race at a top speed of 42km (30km/h using AT wheels).

DJI OSMO ACTION

Put yourself in the picture with DJI's new action camera.

$499 | WWW.DJI.COM/OSMO-ACTION

DJI has been a leader in the consumer cinematography drone space, so we're not surprised it's finally decided to branch out into the action camera market. The Osmo Action uses a 1/2.3-inch sensor to take 12MP photos and record 4K wide-angle footage at 60fps. It also integrates proprietary electronic image-stabilisation tech that DJI developed to eliminate unwanted shaking in full resolution recordings. The removable battery lasts 93 minutes when recording 4K footage, or 135 minutes recording 1080p video with no stabilisation – that puts it roughly on par with GoPro's Hero 7 Black in most regards. The Osmo Action's standout feature, however, is a 1.4-inch front facing display so you can frame selfies better.

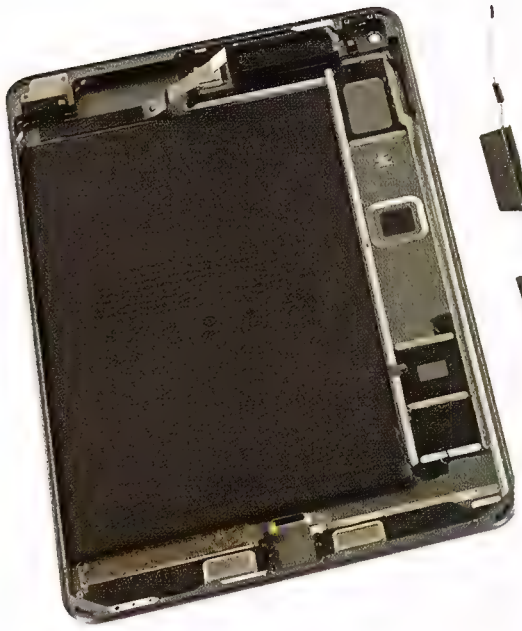
SAMSUNG GALAXY WATCH ACTIVE

Still the smartwatch to beat.

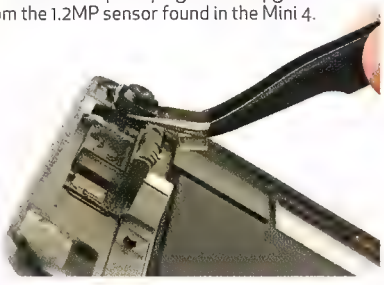
$349 | WWW.SAMSUNG.COM/AU

Samsung's fitness-focused bezel-less smartwatch has finally landed in Australia and while ditching the dial will not sit right with everyone, the new compact design will undoubtedly be appealing to those with daintier wrists. As with its predecessors, the killer feature is offline Spotify playlists, combining with Samsung Pay functionalities for phone-free exercise sessions. The Bluetooth 4.2 connection offers a surprisingly consistent music streaming experience with wireless buds, even when tracking exercise. The battery lifespan is a little light, lasting around 26 hours for active users, and that 1.5GB of onboard storage will fill up in no time, but Samsung's GPS fitness tracking and smartphone app integration are still some of the best available. ■

howit'sdone



The camera is a pretty significant upgrade from the 1.2MP sensor found in the Mini 4.



We're just dealing with standard Phillips heads here.

iPad Mini 5

All the small things.

What's that on our teardown table? It's a big phone! A small tablet! AirPower? No, it's the iPad Mini! This year, Apple revisited its smallest tablet, bucking industry trends by keeping the Mini's screen small and bezels big. Did Apple stick to tradition all around, or will we be treated to an interior redesign? We'll have to tear it down to find out!

MAJOR TECH SPECS

- 7.9-inch LED-backlit Retina True Tone display with 2048×1536 resolution (326 ppi)
- A12 Bionic SoC with 64-bit architecture and embedded M12 coprocessor
- 8MP rear camera and 7MP FaceTime HD camera
- Wi-Fi with dual-channel (2.4GHz and 5GHz) and MIMO support, plus Bluetooth 5.0
- 19.1Wh rechargeable lithium-polymer battery
- Three-axis gyro, accelerometer, barometer, and ambient light sensor

KEY FINDINGS

- From the outside, this new Mini looks exactly like a downsized version of the equally new iPad Air. Spoiler alert: Judging by our X-rays, it's not. It looks exactly like an upgraded iPad Mini 4. We pull a cellular-capable iPad Mini 4 from the lab to confirm our suspicions. Headphone jack: check. Big bezels: check. Home button: check.
- As much as we wish Apple would come up with a better approach to tablet construction, we reckon we know how opening this will go: Heat. Slash. Repeat. Once the Mini is shucked, we get our first peek at the internals. We remove the bracket covering the display and battery connectors, and it brings along a friend. The battery flex connector is now adhered to that bracket, automatically disconnecting the battery. Nifty! Hopefully, this will help fixers to not accidentally kill the backlight on their displays.
- This Mini has a different battery model to its predecessor, with updated (i.e. incompatible) connectors. Rated for 19.32Wh, it matches the previous Mini's, has less than the standard iPad's 32.9Wh, and is just over the Galaxy Note9's 15.4Wh. iPads still lag behind iPhones in construction – the home button being an example. On iPhones, this is an easy, elegant swap, but here it's still a mess of glue.
- This Mini inherits the 7MP f/2.2 front-facing camera setup we first saw in the 10.5-inch iPad Pro. With the cameras out of the way, we get a close look at the new upper microphone array, now centered near the selfie cam.
- The iPad Mini continues to be its own entity – not quite a shrunken-down iPad, nor a miniature iPad Air. After a number of conflicting experiences ultimately leading up to this Mini's glued-in battery, we're no longer optimistic about seeing adhesive pull tabs for iPad batteries.
- Repairability score: 2 out of 10 (10 is the easiest to repair). A single Phillips driver takes care of all the screws. Many components are modular and can be replaced independently, but the Lightning port is soldered to the logic board. Battery replacement is possible, but still difficult. Gobs of adhesive hold many parts and cables in place, complicating repairs. Removing the home button is tough, and will be required for display replacement if you want to keep Touch ID functionality. ■

numbercrunch

» WE LOOK AT THE NUMBERS DRIVING THE BIG TECH NEWS.

600

NUMBER OF TRACKS CREATED BY ENDEL – THE FIRST APP TO BE REWARDED A MAJOR LABEL MUSIC DEAL. THE TRACKS ARE SHORT 'SOUNDSCAPES', IDEAL FOR USE AS BACKGROUND MUSIC IN APPS AND VIDEOS, AND ARE CREATED USING AN ALGORITHM.

1 MILLION

NUMBER OF ASUS PCS VULNERABLE TO THE 'SHADOWHAMMER' MALWARE ATTACK THAT LANDED IN MARCH.

The malware, which posed as a security update, was discovered by anti-virus vendor Kaspersky, which said 57,000 of its customers were affected; while Symantec said 13,000 of its users were. Asus has since issued a patch to fix the issue.

24

NUMBER OF HOURS THAT CLIPPY RETURNED BEFORE BEING KILLED OFF AGAIN.

The former MS Office assistant reappeared in March as a free-to-download animated sticker pack for Microsoft Teams on GitHub, but one day later he was gone.

200-600 MILLION

NUMBER OF FACEBOOK USERS WHO COULD HAVE HAD THEIR PASSWORDS COMPROMISED, THANKS TO AN ASTONISHING SECURITY FLAW WITHIN THE COMPANY.

The passwords, which were stored in plain text, were readily accessible by any one of 20,000 Facebook employees – a situation that persisted for years. The flaw has now been fixed.

US$100 MILLION

AMOUNT OF MONEY *FORTNITE* PUBLISHER EPIC GAMES IS MAKING AVAILABLE FOR MEDIA AND ENTERTAINMENT PROJECTS THAT USE ITS UNREAL ENGINE.

Grants of between US$5,000 and US$500,000 will be awarded to artists, students, developers and others as part of Epic's MegaGrant.

€1.5 BILLION

SIZE OF THE FINE HANDED DOWN TO GOOGLE IN ITS LATEST ANTI-TRUST SPAT WITH THE EU.

Google was in the dock for forcing customers to use its own AdSense service, rather than allowing them to get ad revenue from other search engines. Google's been slapped with EU fines twice before – one for €4.3 billion (about AUD$6.9 billion) in 2018; and another for €2.4 billion (about AUD$3.8 billion) in 2017. ■

twobits

» CHRIS SZEWCZYK TAKES A CLOSER LOOK AT THE TECH INDUSTRY, AND HOW IT AFFECTS YOU.

"Bitcoin itself, along with most reputable altcoins have proven to be exceptionally secure, despite BTC having a US$100 Billion+ target painted on its back."

Crypto kleptos

Chris Szewczyk explains why there's no need to panic over recent crypto hacks.

As an avid follower of crypto currencies for many years, I've seen Bitcoin move from an underground experiment to a genuine new asset class. Bitcoin was a hot topic around Christmas dinner tables in December 2017. $25,000 for one Bitcoin! Even Grandma and Grandpa heard about it on the news. That bubble was always going to burst.

Price aside, all too often cryptocurrencies gain attention for the wrong reasons. Instead of the focus being on their strengths as generally decentralised, cryptographically secure, efficient and trustless instruments, we see headlines such as the one we saw in early May: *Binance hacked and 7000 BTC stolen!* Oh no, not another one...

If it can happen to Binance, it can happen to anyone. The problem isn't the coins themselves. It's the damned exchanges. Sadly, exchange hacks are nothing new. The Mt. Gox hack in 2014 is probably the most well-known. Bithumb in South Korea, Zaif in Japan, Poloniex, the list goes on. The key takeaway is that these hacks are aimed at specific entities, not the coins themselves. Don't panic! Bitcoin itself, along with most reputable altcoins have proven to be exceptionally secure, despite BTC having a US$100 Billion+ target painted on its back. The cryptography behind the coin has proven to be remarkably resilient.

There's a saying. If you don't hold your keys, you don't hold your coin. If you leave your coins on an exchange, you are at the mercy of the exchange and hence any vulnerabilities it may have. It's so important to stress: If you're hodling (crypto slang for holding rather than selling), keep your coins off exchanges.

The best way to secure your coins is with a hardware wallet such as a Ledger or Trezor. They hold your private keys securely offline, and therefore protected from malicious software. You have to get the coins from somewhere though so most people will have to use exchanges at some point. Trading necessitates it.

Essential ground rules include the use of two-factor authentication (not via email) and keeping your recovery passwords, wallet files or QR codes securely offline. Your logins should consist of upper and lowercase letters, numbers and symbols. If you follow these and other basic rules, you'll minimise the chance of having your accounts compromised. Hopefully the exchange you're using is reputable!

Bring on decentralised or non-custodial exchanges. Once the likes of the BTC Lightning and ETH plasma networks are ready to scale to the required levels, then perhaps we'll see the end of vulnerable centralised exchange hacks.

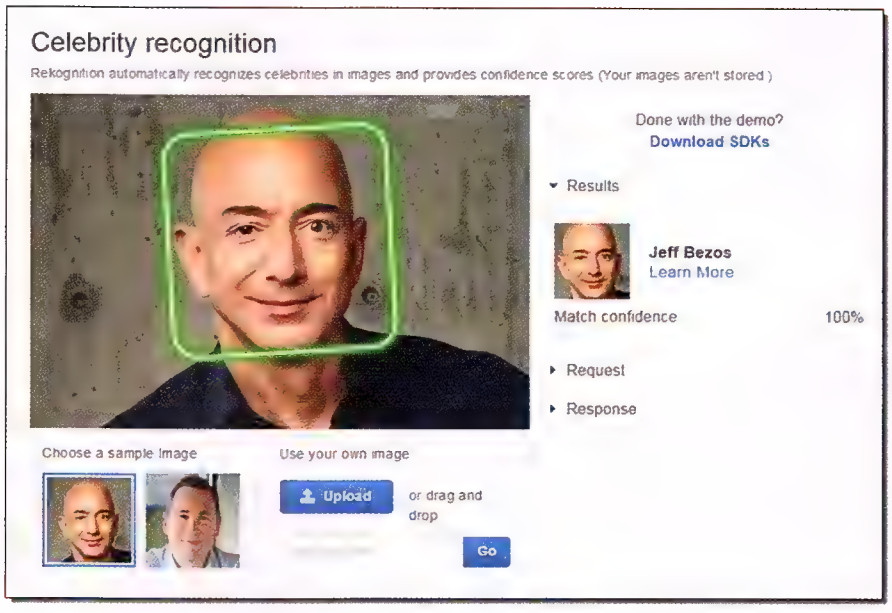
Some of the DEX ideas out there are simply amazing. What if I want to swap frequent flyer miles directly to Japanese Yen? Any kind of tokenised asset swapping might be possible. We can only hope the future brings more attention to the revolutionary aspects of crypto currency and blockchain technology and not the thieves who could ruin it. The potential is there to change the very concept of money and exchanging of value.

Now what if a functioning quantum computer were to break Bitcoin's ECDSA cryptography and access creator Satoshi Nakamoto's long dormant Bitcoin wallet? That would make the Binance hack look like grand theft cookie. Scarily, it could happen.

» SHAUN PRESCOTT DIGS INTO THE BIG TECH ISSUES.

Amazon's facial recognition technology is cause for concern

Investors haven't united in their objections to the tech, but we should, writes Shaun Prescott.



Nowadays it's mostly taken for granted that the biggest tech companies – Google, Amazon, Microsoft and Facebook – are surveilling our internet usage, amassing our metadata, and using it to make a lot of money. But one of the most alarming advancements in surveillance technology is Amazon's Rekognition, a facial recognition tool with a variety of uses, particularly in marketing and advertising and especially in social media. It's cause for discomfort when applied to those fields, but when news emerged last year that Amazon had pitched the technology to the U.S. Immigration and Customs Enforcement agency, many feathers were ruffled, particularly those of the American Civil Liberties Union.

While it's easy to object to the technology in principle, if we're to accept that it will inevitably be used in law enforcement (it already is, by a Washington County Sheriff's Office), the problem of its accuracy is an obvious concern. "People should be free to walk down the street without being watched by the government," the ACLU said last year. "By automating mass surveillance, facial recognition systems like Rekognition threaten this freedom, posing a particular threat to communities already unjustly targeted in the current political climate."

It's hard not to resort to a Kafka analogy: however unlikely, it no longer seems outlandish or surreal that you might be wrongly accused of a crime. An ever-increasing reliance on automated tech in law enforcement will inevitably – not maybe, but definitely – lead to error.

Amazon isn't backing down either, by command of its investors. Last month it rejected two separate proposals made by shareholders which would have prevented (or heavily limited) the sale of Rekognition to government and law enforcement agencies, while also calling for an independent review into the technology's potential flaws. The tally of investors who voted for and against the move wasn't available at the time of writing, and besides, it's a non-binding vote: purely a taking of the temperature.

The tech world seems divided on the issue of facial recognition technology. Microsoft issued a lengthy statement in December calling for "government regulation and responsible industry measures" when it came to the field's advancement. With so many surveillance technologies having crept into our lives with little to no government intervention – and given the money at stake – it's definitely sobering to see a major tech company take issue so strongly.

"We believe it's important for governments in 2019 to start adopting laws to regulate this technology," The Microsoft statement read. "The facial recognition genie, so to speak, is just emerging from the bottle. Unless we act, we risk waking up five years from now to find that facial recognition services have spread in ways that exacerbate societal issues. By that time, these challenges will be much more difficult to bottle back up."

If Microsoft is worried – a tech company which itself profits greatly from behavior data extraction – we should be worried too. ■

END USER

Share your stories!

If you have an interesting story about technology users, their experiences and the issues that affect us all (whether funny or serious), email us at **apcmag@futurenet.com**. All correspondence becomes the property of *APC* and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

Thunderbolt vs USB

Christian Guyuton explains what the differences are between the most common connector types, and which is best suited to specific purposes.

When it comes to transferring data and power, choice of bus is king. The battle between aging champion Universal Serial Bus and plucky new contender Thunderbolt has been an exciting one to watch, and now we're here to put it to bed – for a little while, at least. USB might have had more time to integrate itself into as much technology as possible, but Thunderbolt from Apple and Intel is hot on its heels, and both have their advantages and failings. Which is truly superior, though?

Round 1

VALUE

Our first showdown is easy: It's USB, without a doubt. Even the more recent 3.1 and 3.2 iterations aren't much more expensive than USB 3.0, affordable both for manufacturers to implement and for consumers to purchase – USB drives and cables are almost ubiquitous now, an open platform usable by just about anyone. Thunderbolt, on the other hand, was created as a joint venture between Intel and Apple, and still requires certification from Intel for manufacturers to use. The initial connection with Apple may have harpooned Thunderbolt from the start, if the tech giant's pricey history with its proprietary Lightning connectors is anything to go on, anyway.

Both buses require purchase of control chips for hardware developers, but USB is cheaper, and doesn't require accreditation from Intel to implement. While Thunderbolt 3 and USB-C use the same connector model – meaning that Thunderbolt 3 cables and devices can connect to a computer with a USB Type-C port – to ensure compatibility, manufacturers must shell out to add Thunderbolt tech to their hardware to reach the higher speeds it offers. USB might not be as powerful or flashy as Thunderbolt, but when it comes to examining consumer demand, it offers greater satisfaction against cost.

WINNER:
USB

Round 2

PERFORMANCE

It's hard to argue that USB can outperform Thunderbolt. Looking at the most recent iterations of each (USB 3.2 and Thunderbolt 3), Thunderbolt blows USB out of the water by offering a super-fast 40Gb/s via two aggregated bi-directional channels, in comparison to USB 3.2's 20Gb/s. USB's 3.2 version (confusingly referred to as 3.2 Gen 2x2) still hasn't reached proper market penetration, though, so USB 3.1 and 3.0 are the current popular standards, which only offer 10Gb/s and 5Gb/s respectively. Some motherboards still ship with USB 2.0 ports, which are only capable of 480Mb/s. Thunderbolt 3 is ideal for daisy-chaining devices, too, but every device must be Thunderbolt-compatible; adding a DisplayPort or USB device ends the chain there.

Both current versions can feed DC power both ways at the same maximum rate: 100W for mains system power; 15W for device or peripheral charging from a "master" system. These are theoretical maximums – actual power supply alters based on many factors, such as available power or cable, and connector quality and type. Power supply doesn't impact on data delivery speeds in either format. While USB 4 might be on the horizon, promising Thunderbolt 3-level speeds, right now it's a clear win for Thunderbolt.

WINNER:
Thunderbolt

Round 3

VERSATILITY

USB is everywhere. It's a staple of modern tech, a well-established standard. Thunderbolt 3 is a superset of USB, but is far from seeing the same widespread use. Part of this is due to USB's history. Seven companies – including Intel and Microsoft – banded together to create a new standardised interface. As such, USB has always been versatile and effective, connecting everything from interactive peripherals to speakers, monitors, and drives. Thunderbolt is more purpose-built; ideal for daisy-chaining monitors or downloading data to external drives.

Flash drives with native Thunderbolt interfaces are rare; drives that connect via a Thunderbolt 3 cable are more common, but expensive. Type A USB-connector thumb drives are common, with USB-C versions becoming more popular. USB-C is compatible at full speed with Thunderbolt 3 ports, while the reverse is not the case.

Copper versus optical cabling was an interesting debate in the early years of Thunderbolt. All versions of USB have used copper, limiting maximum range to five meters. Thunderbolt 1 and 2 utilised optical cables to reach maximum lengths of 60 meters, but this functionality was discontinued for Thunderbolt 3 – although using adapters, it can still be managed.

WINNER:
USB

"Thunderbolt blows USB out of the water by offering a super-fast 40Gb/s via two aggregated bi-directional channels, in comparison to USB 3.2's 20Gb/s."

Round 4

FUTURE

USB has existed for over 20 years. It's not going anywhere, but it's also not moving forward at any speed. USB 4 was recently announced, promising Thunderbolt 3 speeds, and the USB Implementers Forum (USB IF) is committed to keeping the interface updated; hence the numerous editions of the third series – that's right, USB 3.2 Gen 1x2 and USB 3.2 Gen 2x2 are subtly different. Extremely subtly. USB lives up to the "universal" in its name, having had far more time than Thunderbolt to beat out competitors and become the industry standard for data and power connections.

Thunderbolt has existed for eight years, but spent the better part of this time serving as a display and power interface for Apple products, primarily MacBook and iMacs, where Thunderbolt 1 could be used for daisy-chaining monitors. The tech went mainstream with Thunderbolt 3, thanks to the adoption of the USB-C model, but the requirements for manufacturers to support Thunderbolt formats may not bode well, particularly with USB 4 being able to match its speeds without demanding additional control hardware. Thunderbolt 3 is an Intel property, too, which means no AMD chipsets or computers support it, with no plans in sight for compatibility.

WINNER:
USB

Round 5

SIMPLICITY

From a manufacturer's standpoint, USB formats are easier to implement and familiar to consumers, particularly with the introduction of the USB-C connector, which can be inserted either way up – finally catching up to Apple's Lightning connectors. The traditional USB connector, running up to 3.2, is a recognisable staple of technology for consumers everywhere. USB ports have the potential for color-coding for easier identification, given the numerous variations on the format.

However, USB's open design let hardware producers create many versions of USB port – DAC-focused ports for speakers and headphones, for example, provide superior sound quality to a conventional USB port. Thunderbolt's closed design benefits it here; there is no variation, so every port delivers maximum performance.

The variety of connectors is more refined with Thunderbolt; 1 and 2 used a Mini DisplayPort connector, while 3 adopted USB-C. USB might be moving toward USB-C as a standard, but still has too many different connectors. The Type A connector is common, but there are still many devices that use outdated Mini and Micro variations – the Micro-B SuperSpeed connector was supported all the way up to USB 3.0, and is horrible as connectors go.

WINNER:
Thunderbolt

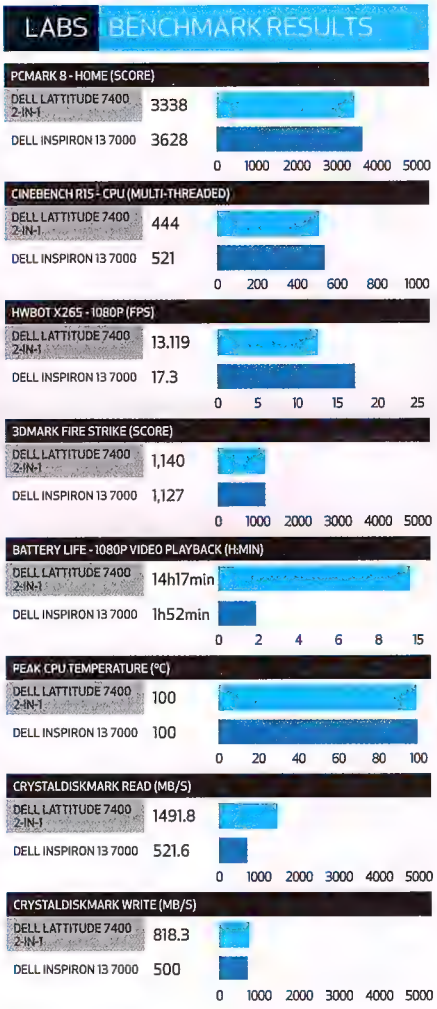
And the winner is...

This feels unfair, but the numbers don't lie: USB went three for two up against Thunderbolt, and thus must be declared the winner. Thunderbolt might be the faster, sexier version, but the fact remains that it owes its very existence to USB. Will Thunderbolt – perhaps the as-yet unannounced Thunderbolt 4, presumably faster than anything seen before it – become the standard for buses in the future? Possibly. But looking at the state of things, it's hard to picture that world.

USB might not be as fast, but the USB IF knows this; with Thunderbolt 3's protocol specs made public in March, USB 4 was swiftly announced to match it. With the sheer prevalence of the Type A connector, USB may have reached market penetration to the point where nothing can unseat it. The low cost of USB peripherals, cables, and drives makes it the most popular choice, and unless Intel can drive down the costs associated with Thunderbolt, it doesn't seem likely that it could overtake its competitor. It's had two decades to establish itself as the gold standard for bus interfaces, so USB isn't going anywhere anytime soon.

LAPTOP

FROM $3,519 | WWW.DELL.COM


LABS BENCHMARK RESULTS
PCMARK 8 - HOME (SCORE)
DELL LATTITUDE 7400 2-IN-1 3338
DELL INSPIRON 13 7000 3628
0 1000 2000 3000 4000 5000
CINEBENCH R15 - CPU (MULTI-THREADED)
DELL LATTITUDE 7400 2-IN-1 444
DELL INSPIRON 13 7000 521
0 200 400 600 800 1000
HWBOT X265 - 1080P (FPS)
DELL LATTITUDE 7400 2-IN-1 13.119
DELL INSPIRON 13 7000 17.3
0 5 10 15 20 25
3DMARK FIRE STRIKE (SCORE)
DELL LATTITUDE 7400 2-IN-1 1,140
DELL INSPIRON 13 7000 1,127
0 1000 2000 3000 4000 5000
BATTERY LIFE - 1080P VIDEO PLAYBACK (H:MIN)
DELL LATTITUDE 7400 2-IN-1 14h17min
DELL INSPIRON 13 7000 1h52min
0 2 4 6 8 15
PEAK CPU TEMPERATURE (°C)
DELL LATTITUDE 7400 2-IN-1 100
DELL INSPIRON 13 7000 100
0 20 40 60 80 100
CRYSTALDISKMARK READ (MB/S)
DELL LATTITUDE 7400 2-IN-1 1491.8
DELL INSPIRON 13 7000 521.6
0 1000 2000 3000 4000 5000
CRYSTALDISKMARK WRITE (MB/S)
DELL LATTITUDE 7400 2-IN-1 818.3
DELL INSPIRON 13 7000 500
0 1000 2000 3000 4000 5000

Dell Latitude 7400 2-in-1

Is this premium 2-in-1 better for business, or is it a lateral move from Dell?

Dell has maintained a strong command in the business ultrabook space over the last few years with its XPS range, and despite the fact that you can get both the 13 and 15 inch XPS models in a 2-in-1 configuration – or choose from an entire range of Inspiron 2-in-1 laptops – Dell also has a New Latitude 7400 2-in-1 for you to take home. Technically the Latitude family is pitched at commercial customers since they come with a Windows 10 Pro OS and additional security features like a fingerprint scanner and an infra-red camera, but there's no reason you couldn't pick one up as a consumer.

The main benefit of the Latitude range is a more generous battery that'll keep you working longer. The base model (the one tested here) comes with a 42Wh battery that'll get seven hours and 18minutes under heavy workloads and pushes 14 hours and 17 minutes for 1080p movie playback. Dell is planning on releasing an even bigger 60Wh Long-life Polymer battery for the clamshell Latitude 7400 in July and it showed off a 72Wh model with a reported 26h battery life at CES.

For the most part the device has a pretty standard configuration utilising an Intel Core i5-8265U or i7-8665U, 8GB of RAM and either a 256GB or 512GB NVMe SSD. This is paired with a 14-inch FullHD touchscreen that fully folds back on itself to transform into a convertible tablet. While the main interface connections are two Thunderbolt ports, the device also includes a number of other useful options, including: HDMI plus two USB 3 (Type-A), ports, an SD card reader and a 3.5mm headphone jack, for a nicely rounded set of interface options. The keyboard has a decent travel distance for a convertible but the membrane keys feel a little mushy and the trackpad is small and overly sticky when scrolling.

In general home and office task benchmarks the core i5 Latitude 7400 2-in-1 was less than 8% behind a Dell Inspiron 13 7000 that we tested last year. This was impressive considering the Inspiron 13 had a Core i7-8550U CPU and double the RAM allocation of the Latitude 7400. These scores were a bit closer to what we were predicting on Cinebench's multi-threaded CPU benchmark and HWBot's 1080p media encoding test where the Latitude came in 17.3% and 31% behind respectively. Both these laptops use an integrated Intel UHD 620 graphics card, so for any GPU benchmarks the two were functionally identical on any graphically intensive applications.

It might seem unfair to compare the i5 Latitude to an i7 Inspiron, but if you consider the i7 Inspiron is $1,120 less than the i5 Latitude and that you can get it on sale for almost $2,000 less, that disparity seems less valid. Sure, the Inspiron only has a 28Wh battery and doesn't include the enterprise features, but these features don't fully account for that price difference. ■ **Joel Burgess**

Verdict

A long lasting 2-in-1 workhorse with plenty of power but it could do with a good price cut.

★★★☆☆

NAS

$1,099 | WWW.SYNOLOGY.COM

Synology DiskStation DS1019+

A great 5-bay NAS for those needing a bit more oomph.

NAS units are more than simple file servers these days. They run all sorts of server apps that require faster CPUs and faster storage than the humble NAS units of the past provide. Synology's new DiskStation DS1019+ is kitted out with hardware features that reflect the demands placed on NAS units in 2019.

The DS1019+ is built around an Intel Celeron J3455, quad-core, 64-bit CPU. This CPU contains not only hardware video transcoding support (Intel QuickSync), but a hardware encryption engine (AES-NI) as well. These features mean applications like Plex or Emby can transcode video, or you can encrypt your storage array without an impact on overall performance.

Also inside the DS1019+ is 8GB of DDR3L RAM. That's quite a fair chunk of memory for a NAS, so it'll be tough for the average user to run out of memory doing the typical home server related tasks. That said, out of the factory the 8GB is provided via two 4GB SO-DIMMs that can be upgraded at your leisure, should you be running applications that demand more than the included 8GB of RAM.

If four drive bays aren't enough for your storage needs, the DS1019+ has 5-bays for 3.5-inch or 2.5-inch drives. With the latest 14GB SATA HDDs, there's the potential for 70TB of raw storage (more like 56TB after you've enabled Synology's Hybrid RAID).

One of the unique features of the DS1019+ are two M.2 NVMe PCIe SSDs for blazing fast storage. What's the point of these M.2 slots in a NAS? Synology also has a feature called "SSD Cache" that stores frequently accessed data on the speedy SSDs, reducing I/O latency and improving system performance. SSDs installed in the M.2 slots can also be used to host server applications (e.g: internal wikis, databases, development servers, etc.) with superior performance to SATA hard disks.

Considering the DS1019+ contains a relatively fast CPU (for a NAS), loads of RAM and two slots for super quick SSDs, it's interesting Synology didn't kit it out with 10GbE LAN ports. There's two 1 GbE LAN ports that can be configured for either link aggregation or failover, but even with 200MB/sec of bandwidth, a RAID array of modern disks and even a single PCIe NVMe SSD will be bottlenecked.

Software wise, the DS1019+ runs DiskStation Manager 6.2 (aka DSM) – subjectively the best NAS operating system on the market. There's loads and loads of features, with some highlights including Docker support, Let's Encrypt integration, Office 365 & G Suite backups, iSCSI built-in and a vast array of third-party packages – if it doesn't run on DSM, you probably don't need it.

QNAP's TS-473 is probably the closest competitor, which only has four drive bays and less RAM, but packs 10 GbE LAN, a faster CPU and PCIe expansion card slots. But what makes the DS1019+ stand out is Synology's DSM software, which has a slight edge in features over the QNAP, making the Synology a more pragmatic purchase unless the hardware specs of the QNAP really matter to you. ■ **Anthony Agius**

Verdict

Great baseline specs, and built upon the finest NAS OS out there.

★★★★☆

SOUNDCARD

$449 | WWW.EVGA.COM

EVGA Nu Audio

We didn't hear this one coming.

Last issue, we asked: Do you need a soundcard? This issue, we ask simply: Do you need this one? Stylistically and on the spec sheet, EVGA's high-end Nu Audio discrete soundcard is aimed squarely at gamers, but in truth, this is as much about enjoying better music.

Let's start with the headline numbers: Playback and recording formats go up to 384kHz, 32-bit audio, signal-to-noise ratio is nice and high at 123dB, and there's a generous array of ins and outs comprising stereo and headphone-outs, 3.5mm line and mic-ins, an optical-out, and front panel header.

There's also, rather inexplicably, an RGB lighting panel on the card itself, which is customizable via EVGA's Nu Audio software. We can get on board with RGB on keyboards and even graphics cards these days, just as long as we can turn it off or program the color profiles to our taste.

Installation is very similar to that of a GPU: Slide it into a free PCIe slot, hook up a power cable, and attach the header to the side of the card. This is a minor niggle for cable management virtuosos, because it would have been much easier to keep things tidy if both connectors were at the back. As it is, you'll have to get creative with cable ties if you want to preserve the clean lines inside your case. Unlike many external DACs, however, this card requires its own drivers to work, so there's marginally more fuss to the setup than you'd find from something like the Woo Audio WA7D Fireless. The offset is that you get the benefits of EVGA's software for your troubles, although frankly it's nothing particularly special. It's a basic offering, which allows control of inputs, and features six custom EQ profiles. The user has to create all these profiles, however, and that's disappointing, given this card's high price point – a handful of basic profiles for different music genres or activities would have been nice. Compounding that downer, it's actually quite confusing to save and apply these EQ profiles yourself. Iterations are needed on EVGA's part to make this side of the bargain seem like much more of a meaningful benefit.

However, once you hook up some speakers or headphones to the card, you immediately understand the advantage of this hardware. It's an incredibly clean and warm sound, which gives audio sources space to breathe, and gives your ears the chance to hear the subtle details you might otherwise have missed. It inspired us to revisit that holy grail of atmospheric in-game sound, *Thief: The Dark Project*, and 20 years on, it's never sounded better. *Fortnite* and *PUBG* don't offer quite the same amount of raw atmospherics, but their soundscapes become clearer using the Nu Audio and our BeyerDynamic DT770s than most gaming headsets allow. You can almost hear the chicken dinner roasting. Whether it improves gaming performance is a question best left to those at the apex of esports. There are too many other variables impacting our performance here at amateur (read: "terrible") level, so there's only so much you can read into the fact that we didn't instantly become better battle royale or online shooter players. For us, it's sufficient that the difference is so discernible compared with an onboard sound or USB gaming headset setup.

Except for its lackluster accompanying software, the Nu Audio does everything it's supposed to: staggeringly better sound than you would achieve from onboard sound chips, ease of use, and strong I/O options. It's not for home recording, folks, but it checks the boxes confidently for gamers.

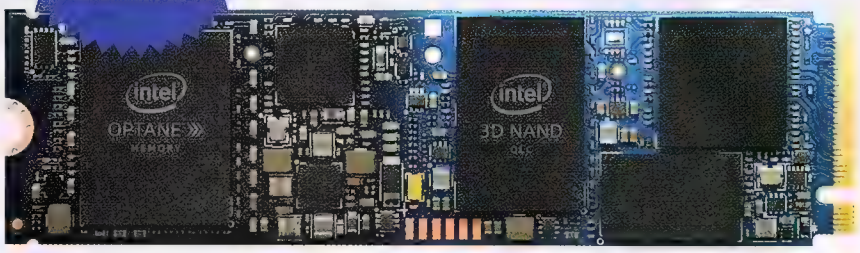
Phil Iwaniuk

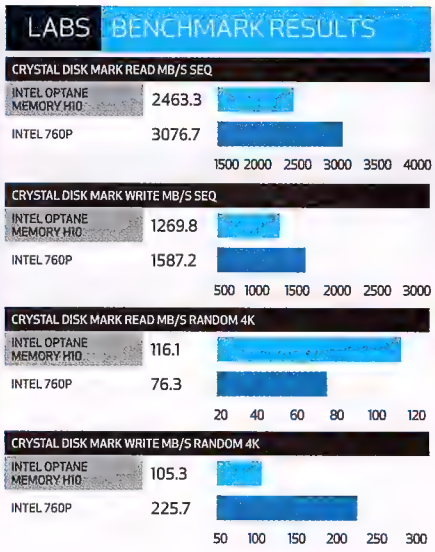
Verdict

Easy setup; clean, warm tone, though the software could do more.

★★★★☆

apc RECOMMENDS





SSD

$N/A | WWW.INTEL.COM.AU

Intel Optane Memory H10 SSD

Optane memory meets NAND flash in a single hybrid drive.

Intel's Optane solutions have been on the market for some time, though they've been relegated to the ultra-high end and enterprise markets or alternatively as low capacity cache drives. As has been the case for most of Optane's life, the cache drives are typically too small and the enthusiast drives are typically too expensive. For Optane to really succeed, Intel needs something in the middle. The H10 we're reviewing here might just be the device that brings a wide deployment of Optane to the masses.

Intel's Optane Memory has some significant advantages versus NAND flash, notably its excellent random access performance and low latency. The H10 model we have on hand pairs 32GB of Optane memory with 512GB of QLC NAND, combining both into one M.2 drive. This allows access to a whole new market of storage limited laptops and ultra-portables that can make use of Optane's strengths.

Spec-wise the H10 supports all the features common to traditional SSD's like TRIM and SMART monitoring. It also supports AES-256 bit encryption which we're happy to see. There's a five year warranty and an endurance rating of 150TBW for the 512GB model we tested. For now the highest capacity H10 is a 1TB model paired with 32GB of Optane memory.

At the time of writing, Intel had not released the H10 for the retail market. The H10 is not a simple plug and play device as it requires motherboard hardware and BIOS support along with Intel's RST software. In order to test the H10, Intel provided a HP Spectre X360 notebook which has gone through all the testing and validation procedures to make it ready for prime time. Unfortunately this means the SSD test data from our Z370 test platform cannot be used for comparison.

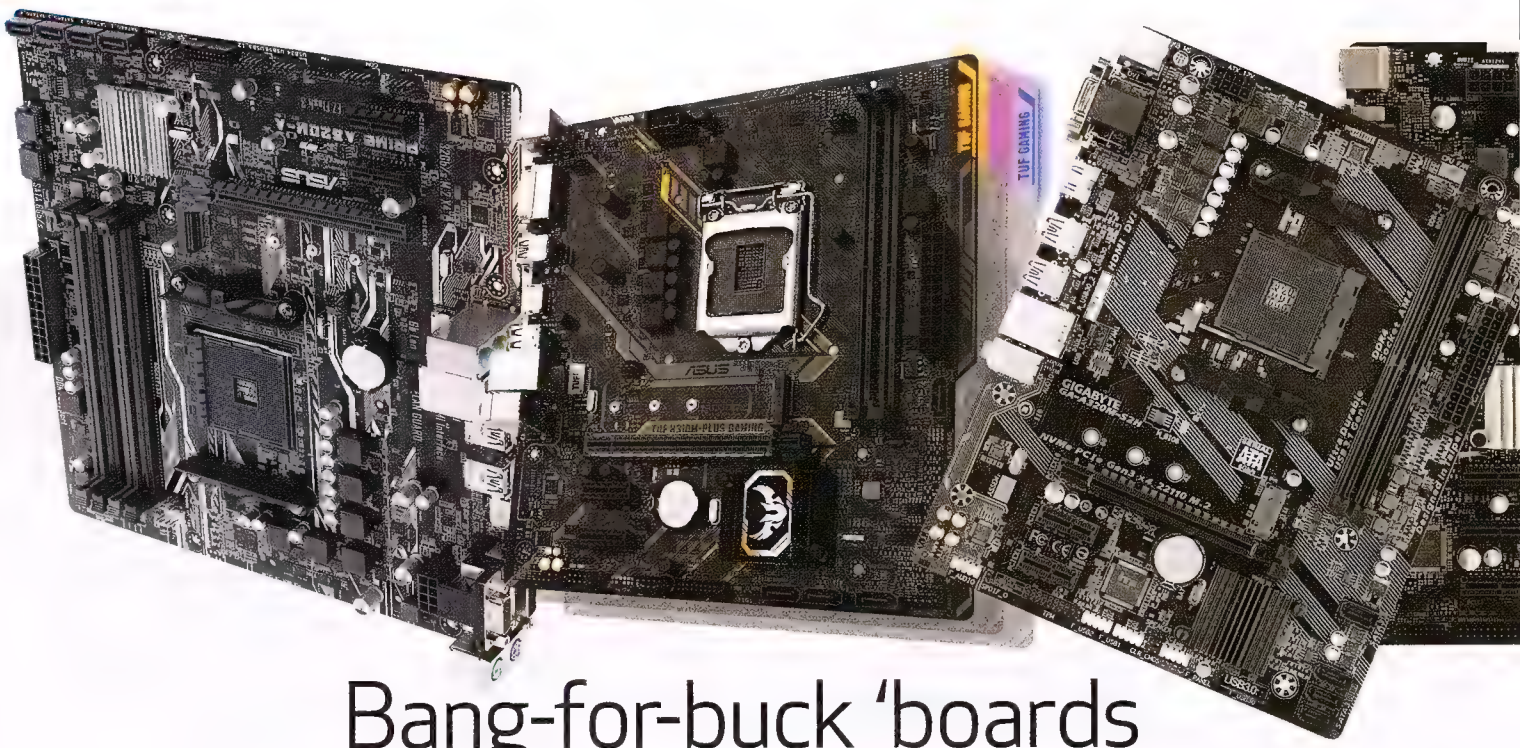
As you can see from the benchmarks, Optane excels at random read performance, this is exactly the kind of number that translates into making your system 'snappy'. There are some oddities though. Write performance was strangely slower than we expected vs an Intel 760P. Synthetic numbers aren't what Optane is about though. In fact our benchmark suite hardly applies here. System responsiveness and application load times are where it shines, particularly when multi-tasking as the Excel benchmark test shows. It's the real world performance that matters. That's where the H10 is at its best.

For now the H10 is only being offered to OEMs. When (or if) the H10 makes it to retail, we probably wouldn't recommend it over an enthusiast NVMe SSD. The real world tangible benefits won't justify it. Having said that, if you're buying a new notebook that offers the H10 as an option, then price depending, it's basically a no brainer as the drive will come configured to work silently in the background.

Chris Szewczyk

Verdict

Intel's H10 hybrid drive offers excellent system responsiveness that's well suited to a laptop or Ultrabook.



Bang-for-buck 'boards

Chris Szewczyk tests seven AMD and Intel motherboards that are small on price but big on value.

Budget motherboards are one of the most overlooked of all PC components. They're so... well, ordinary. They omit extraneous extras, instead focusing on the core connectivity and expansion options that a basic PC needs. They're also high volume sellers for motherboard manufacturers, often finding their way into OEM PCs with customers being none the wiser.

If you're looking to build a basic PC on a tight budget, selecting a simple 'board is always the best starting point – and a surprising amount of users will still be served well by motherboards with likes of Intel's H310 and AMD's A320 chipsets. Even today's low-end desktop PCs are quite capable of performing tasks that are impractical (if not impossible) on phones, laptops and tablets. And cheap does not necessarily have to mean nasty!

The savings made by choosing a budget motherboard allows you to divert dollars towards other components that make your PC tangibly better. A bigger SSD? A faster graphics card? Consider one of these budget motherboard options, and you'll be able to fund critical upgrades elsewhere.

AMD A320: A FEATURE-RICH BUDGET CHIPSET

AMD has earned a solid reputation over the years for its budget motherboards and CPUs, partly because of a lack of competitive products in the higher-end market (at least until the launch of Ryzen). AMD's A320 motherboards are surprisingly feature rich compared to the relatively handicapped Intel H310.

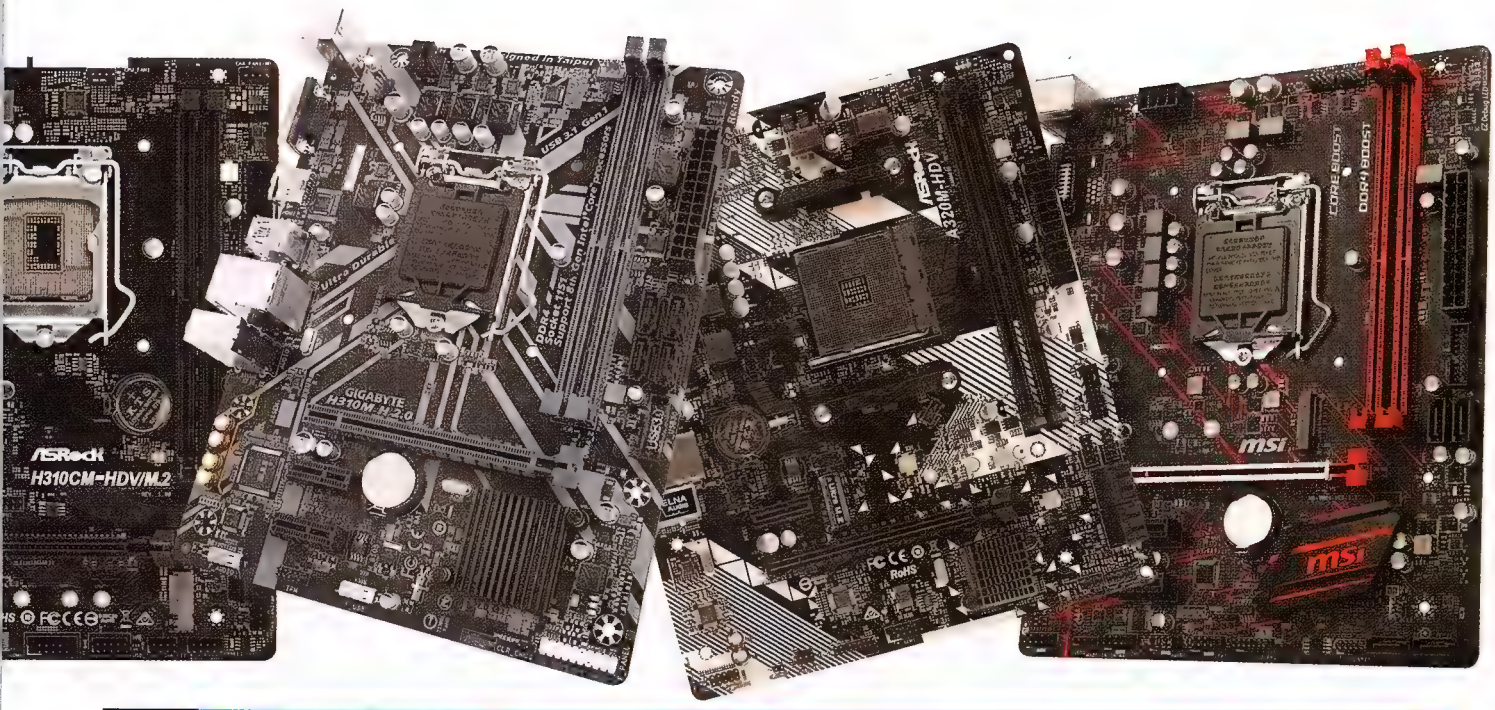
You get support for up to four memory modules at DDR4-3200, PCIe 3.0 x4 M.2 support and six SATA ports, all notable advantages over H310. Platform longevity is particularly significant. The AM4 socket has more life in it, meaning that future Ryzen 3000-series CPUs and APUs should work with A320 boards after a BIOS upgrade.

Of course not all A320s support the full feature set. Some are very basic indeed. If you're building your own system, dropping an extra $10 or $20 on a better equipped A320 board could be well worth it.

INTEL H310: THE CHEAPEST WAY INTO THE INTEL ECOSYSTEM

As mentioned above, motherboards with the H310 chipset come with limitations to consider compared to A320 and even Intel's own B360. H310 only supports one DIMM per memory channel (for two DIMMs in total) with a maximum speed of DDR4-2666. Basic H310 motherboards only support a maximum of 10 USB ports, four of which can be USB 3.1 Gen 1 while there is no support for Gen 2. There's also no support for Intel's Optane caching technology. Also noteworthy is PCIe 2.0 x4 support for a M.2 drive. This means there is little point in pairing a high end PCIe 3.0 supporting M.2 SSD with a H310 motherboard. Stick to a budget NVMe or SATA M.2 drive.

All this illustrates that H310 is clearly a low-end chipset. However, if your heart's set on building a basic Intel machine, it will do the job perfectly well. Intel CPUs remain stronger under lightly-threaded loads, so if you can live with the feature limitations of the H310 chipset, you'll still get strong CPU performance when pairing an Intel CPU and H310 motherboard together.



LABS BENCHMARK RESULTS

X264 FHD VIDEO ENCODING (FPS)

ASUS PRIME A320M-A	40.06
GIGABYTE A320M-S2H	40.62
ASROCK A320M HDV R4.0	39.94
MSI H310M GAMING PLUS	33.49
ASUS TUF GAMING H310M-PLUS GAMING	33.91
GIGABYTE H310M H 2.0	33.57
ASROCK H310CM HDV/M.2	32.87

0 10 20 30 40 50

CINEBENCH 15 (MULTI THREAD SCORE)

ASUS PRIME A320M-A	1,266
GIGABYTE A320M-S2H	1,269
ASROCK A320M HDV R4.0	1,265
MSI H310M GAMING PLUS	940
ASUS TUF GAMING H310M-PLUS GAMING	938
GIGABYTE H310M H 2.0	941
ASROCK H310CM HDV/M.2	938

0 250 500 750 1,000 1,250

CINEBENCH 15 (SINGLE THREAD SCORE)

ASUS PRIME A320M-A	160
GIGABYTE A320M-S2H	161
ASROCK A320M HDV R4.0	160
MSI H310M GAMING PLUS	170
ASUS TUF GAMING H310M-PLUS GAMING	170
GIGABYTE H310M H 2.0	171
ASROCK H310CM HDV/M.2	169

0 50 100 150 200 250

7ZIP (MILLION INSTRUCTION PER SECOND)

ASUS PRIME A320M-A	33,651
GIGABYTE A320M-S2H	33,777
ASROCK A320M HDV R4.0	33,361
MSI H310M GAMING PLUS	25,775
ASUS TUF GAMING H310M-PLUS GAMING	25,844
GIGABYTE H310M H 2.0	25,901
ASROCK H310CM HDV/M.2	25,750

0 7,000 14,000 21,000 28,000 35,000

GEEKBENCH 4 (MULTI CORE SCORE)

ASUS PRIME A320M-A	21,308
GIGABYTE A320M-S2H	20,959
ASROCK A320M HDV R4.0	21,138
MSI H310M GAMING PLUS	20,179
ASUS TUF GAMING H310M-PLUS GAMING	20,288
GIGABYTE H310M H 2.0	20,292
ASROCK H310CM HDV/M.2	19,978

0 5,000 10,000 15,000 20,000 25,000

GEEKBENCH 4 (SINGLE CORE SCORE)

ASUS PRIME A320M-A	4,413
GIGABYTE A320M-S2H	4,444
ASROCK A320M HDV R4.0	4,362
MSI H310M GAMING PLUS	5,108
ASUS TUF GAMING H310M-PLUS GAMING	5,136
GIGABYTE H310M H 2.0	5,150
ASROCK H310CM HDV/M.2	5,110

0 1,000 2,000 3,000 4,000 5,000

3DMARK FIRESTRIKE (SCORE)

ASUS PRIME A320M-A	17,646
GIGABYTE A320M-S2H	17,772
ASROCK A320M HDV R4.0	17,777
MSI H310M GAMING PLUS	18,089
ASUS TUF GAMING H310M-PLUS GAMING	18,326
GIGABYTE H310M H 2.0	18,292
ASROCK H310CM HDV/M.2	18,189

0 4,000 8,000 12,000 16,000 20,000

SHADOW OF THE TOMB RAIDER (1080P, LOW, DX12, AVG FPS)

ASUS PRIME A320M-A	110
GIGABYTE A320M-S2H	112
ASROCK A320M HDV R4.0	111
MSI H310M GAMING PLUS	129
ASUS TUF GAMING H310M-PLUS GAMING	130
GIGABYTE H310M H 2.0	131
ASROCK H310CM HDV/M.2	129

0 30 60 90 120 150

GHOST RECON: WILDLANDS (1080P, LOW, AVG FPS)

ASUS PRIME A320M-A	139.5
GIGABYTE A320M-S2H	139.5
ASROCK A320M HDV R4.0	139.1
MSI H310M GAMING PLUS	159.7
ASUS TUF GAMING H310M-PLUS GAMING	162.7
GIGABYTE H310M H 2.0	162.5
ASROCK H310CM HDV/M.2	159.3

0 40 80 120 160 200

"H310 will do the job perfectly well, while retaining the basic core capabilities of a high end motherboard."

Specs: Intel H310 Chipset; Socket 1151; Support for 8th & 9th Generation Intel processors; 1 x M.2; 4 x SATA; up to 4 x USB 3.1 Gen 1, 6 x USB 2.0; Intel I219-V Gigabit LAN; Realtek ALC887 7.1 Channel HD Audio; mATX Form Factor.

$85 | WWW.ASROCK.COM

Asrock H310CM-HDV/M.2

Cheap but surprisingly well-equipped.

These days it's unfair to pigeon hole Asrock as a value oriented brand, though there's no doubting that it's still one of its particular strengths. For just $85 the H310CM-HDV/M.2 includes hardware we'd expect only on the higher-end H310 models.

The H310CM is a little unusual in its design, with the chipset located above the PCIe slot and the M.2 connector underneath it. This could lead to additional heat being blown straight onto an already heat sensitive M.2 drive. These days the main M.2 slot is often placed above the primary PCIe slot.

Spec-wise, the Asrock H310CM is quite amazing for its price. You get all the features on offer from a H310 chipset board, including the full four SATA ports and dual memory slots. ASRock has also managed to include an Intel I219V Gigabit LAN controller, which is basically unheard of at this price. The board also offers three display outputs, consisting of HDMI, DVI-D and VGA ports.

About the only thing that stops the ASRock from getting full marks is its lackluster performance. It didn't win in any category, though as is often the case, a percent here or there is really no cause for alarm.

If you're looking for a terrific value H310 board, look no further than this Asrock model. It won't win any beauty contests and has some questionable design choices, but we can forgive that at this price. Essentially, it matches the higher end H310 boards for features, yet costs 30% less!

Verdict

Asrock keeps the price to a minimum without sacrificing key features.

★★★★½

Specs: Intel H310 Chipset; Socket 1151; Support for 8th & 9th Gen Intel processors; 1 x M.2; 4x SATA; up to 4 x USB 3.1 Gen 1, 6 x USB 2.0; Intel I219-V Gigabit LAN; Realtek ALC887 7.1 Channel HD Audio; mATX Form Factor.

$109 | WWW.ASUS.COM/AU

Asus TUF H310M-Plus Gaming

A premium design that contrasts with its affordability.

Like MSI (opposite), Asus has managed to produce a gaming-themed board at a price that allows you to divert a few dollars more over to a graphics card, which as we all know, is what really affects gaming performance the most.

Being a member of Asus' TUF Family, The H310M Plus Gaming is designed with electrical stability and reliability in mind. There's plenty of electro static discharge protection across the board. The VRM is decent at this price. If it had a heatsink we might even consider running 95W high core count CPUs on it.

And can you believe it – there's even a splash of RGB on board! It's certainly the most attractive looking board in the roundup. There's even a RGB header on board if you fancy adding a bit of extra bling to your PC. A budget system that can shine like ones at twice the price? Nice! There's a welcome M.2 slot, HDMI and DVI-D ports and audio PCB isolation. Feature wise, it's about as good as it gets before moving up to a B360-chipset equipped board.

We expected the Asus TUF to perform strongly in our benchmark tests, it did OK but didn't really stand out in any one area. When comparing boards with very similar prices and feature sets, it can be difficult as sometimes there isn't much to split them. The Asus came across as the most polished board of all in our test. It's got a premium look and feel that belies its affordable price.

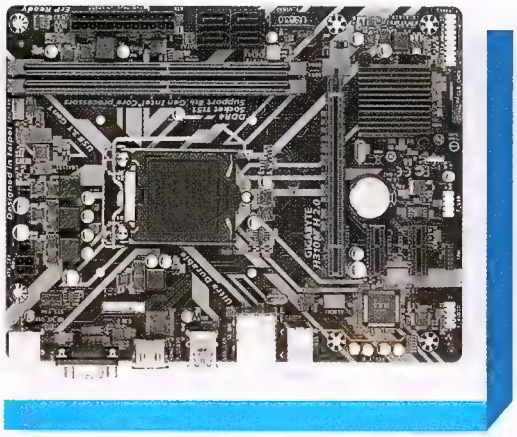
It's easy to recommend this one to Intel system builders looking for good bang for buck... and good looks too.

Verdict

A surprisingly well-presented board that's a solid choice for a budget gaming build.

★★★★★

Specs: Intel H310 Chipset; Socket 1151; Support for 8th & 9th Gen Intel processors; 4 x SATA; up to 4 x USB 3.1 Gen 1, 6 x USB 2.0; Realtek Gigabit LAN; Realtek ALC887 7.1 Channel HD Audio; mATX Form Factor.



$89 | WWW.GIGABYTE.COM.AU

Gigabyte H310M-H-2.0

The embodiment of no frills.

The Gigabyte H310M-H-2.0 is the definition of a no-frills motherboard. It's the kind of board that's probably unlikely to be purchased by a DIYer, instead being included in a PC store's budget system.

The H310M-H 2.0, being one of Gigabyte's cheapest motherboards isn't going to win a features checklist comparison. It's unfair to compare this board to the Asus and MSI H310 models that cost a good 30% more, but we can compare it to the Asrock opposite, which comes in a few of bucks cheaper but also includes a significantly better feature set. It's the only board in the roundup to lack an M.2 slot and the only H310 board not to include Intel LAN. You do get an HDMI port and a decent audio solution, so if you're looking at some basic gaming on integrated graphics, you'll be served well by what's here.

As is the case with all the H310 motherboards in the test, we'd avoid the 95W CPU models, particularly those with eight cores, as the basic heatsink-less VRM is simply not optimal.

The baby Gigabyte did perform admirably in our benchmarking tests, indicating that the designers haven't neglected the BIOS side of the board, which manufacturers have been known to do with their cheapest boards.

If you're looking to build the cheapest system possible, by all means consider the H310M-H 2.0. It's a surprisingly solid performer, but you will lose out on some features. If you're using a SATA SSD or a Wi-Fi adapter then of course, it doesn't matter. It's certainly no slouch.

Verdict

This little Gigabyte board performs well, but isn't what we'd call feature-packed.

★★★½☆

Specs: Intel H310 Chipset; Socket 1151; Support for 8th & 9th Gen Intel processors; 1 x M.2; 4 x SATA; up to 4 x USB 3.1 Gen 1, 6 x USB 2.0; Intel I219-V Gigabit LAN; Realtek ALC887 7.1 Channel HD Audio; mATX Form Factor.

$109 | AU.MSI.COM

MSI H310M Gaming Plus

A competent budget gaming option.

MSI is probably the most 'gamerfied' of the motherboard brands, so it's no surprise to see the company produce a gaming-themed Intel motherboard for the budget DIY market. (Sadly, MSI opted not to provide an A320 board for our roundup.)

The MSI H310M Gaming Plus is a premium tier H310 board, though like all the other H310 boards, it is quite handicapped compared to A320 or Intel B360 boards. Key features include M.2 support, Intel LAN and support for MSI's Mystic Light Sync RGB ecosystem. Budget system builders won't find anything to complain about here.

The Asus and MSI H310M challengers are very similar in spec and price, so it comes down to performance to separate them. As a gaming product we'd hope that MSI would be at least very competitive in our gaming benchmarks but in this case it was behind in every test compared to the Asus. Though the differences are minor, it's better to be a nose ahead than behind.

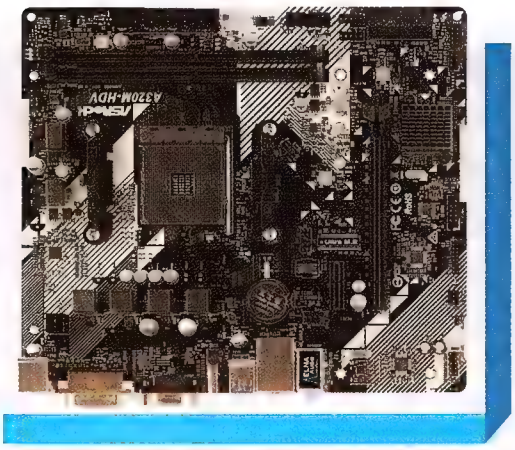
The MSI H310M Gaming Plus is an unremarkable performer with a solid feature set. If you're an MSI fan it will definitely serve you well. This end of the market is so cut-throat though, as a system builder we'd lean towards the Asus by a hair's width. The MSI did perform well in CPU oriented tests and we believe the MSI BIOS is still the best on the market. If you're looking for a board to base your budget gaming build on, the MSI H310M Gaming Plus is still worth considering.

Verdict

MSI's H310M Gaming Plus isn't bad but doesn't do anything to really stand out.

★★★★☆

Specs: AMD A320 Chipset; Socket AM4; Support for AMD Ryzen CPUs & APUs; 4 x SATA; 1x M.2; up to 6 x USB 3.1 Gen 1, 6 x USB 2.0; Realtek Gigabit LAN; Realtek ALC887 7.1 Channel HD Audio; mATX Form Factor.



$79 | WWW.ASROCK.COM

Asrock A320M-HDV R4.0

Asrock finds a way to undercut the competition.

Asrock's name is synonymous with value motherboards and its A320M-HDV R4.0 (that rolls off the tongue...) is a good example of what Asrock can manage to include on a board that's just $79. There aren't too many motherboards on the market cheaper than that.

The silkscreened patterning on the board might not look the greatest, but then who expects RBG or a beautiful design at this end of the market? This board is all about value and it's got it where it counts. A PCIe 3.0 x4 slot for a full speed M.2 drive is welcome at this price, though you don't get the full spec capabilities of the platform with just four SATA ports and two memory slots. That's fairly understandable at this sub-$80 price, although you do still get a full set of I/O ports, many of which even offer ESD and surge protection.

There's four USB 3.1 ports to go along with two USB 2.0, HDMI, VGA and DVI-D ports. There's a single combo PS/2 port along with Realtek Gigabit LAN and Realtek ALC887 audio to round things out.

The A320M-HDV R4.0 trailed in the benchmark tests more often than not, though perhaps that's due to the strength of the Gigabyte than any real weakness of the Asrock.

Once again, Asrock manages to undercut the competition on price. If you absolutely must spend as little as possible then there's nothing wrong with this little Asrock, but for an extra $10 it's hard to ignore that the Asus offers a more polished package overall.

Verdict

Consider this ASRock if you must spend as little as possible.

★★★½

Specs: AMD A320 Chipset; Socket AM4; Support for AMD Ryzen CPUs & APUs; 6 x SATA; up to 4 x USB 3.1 Gen 1, 6 x USB 2.0; Realtek Gigabit LAN; Realtek ALC887 7.1 Channel HD Audio; mATX Form Factor.

$89 | WWW.ASUS.COM/AU

Asus A320M-A

Well presented, yet unremarkable.

Asus might be better known for its high-end and ROG products, but that doesn't mean it can't cater for the budget end of town too. The A320M-A is a mATX board that offers terrific value at just $89 dollars. Though it's not a TUF board, the A320M-A features plenty of electrical tricks including ESD protection for the LAN, USB, VGA and PS/2 ports – worth considering if your area is prone to lightning storms!

The rear I/O contains a solid compliment of ports including four USB 3.1 Gen 1 along with a pair of USB 2.0s. There's a HDMI 1.4b port, VGA and DVI-D ports. The single Gigabit LAN port is controlled by a Realtek RTL8111H controller. A pair of PS/2 ports (does anyone actually have a PS/2 mouse anymore?) and three audio jacks connected to a Realtek ALC-887 controller rounds things out.

You get the welcome PCIe 3.0 x4 M.2 slot and six SATA ports which should take care of all reasonable storage needs. Four memory slots are present, so you could equip 64GB of RAM if you really wanted to.

Performance is bang on where we expect it to be. Though Gigabyte's A320 model has its nose in front more often than not, the differences are minor.

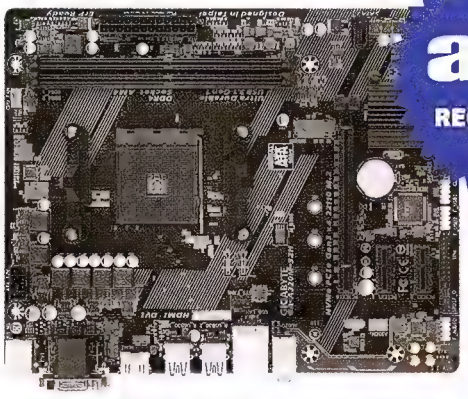
The A320M-A and the Gigabyte A320 have essentially identical specifications and performance, so your choice may come down to simple brand loyalty and pricing if nothing else. The Asus A320M-A does exactly what we expect, yet deserves credit for its impressive design. It's a solid board that will do its job, no fuss.

Verdict

Asus' A320M-A adds a bit of polish to what would usually be a rather unremarkable product.

★★★★½

AMD A320 Chipset; Socket AM4; Support for AMD Ryzen CPUs & APUs; 4 x SATA; up to 6 x USB 3.1 Gen 1, 6 x USB 2.0; Realtek Gigabit LAN; Realtek ALC887 7.1 Channel HD Audio; mATX Form Factor.



apc RECOMMENDS

$89 | WWW.GIGABYTE.COM.AU

Gigabyte A320M-S2H

Capable, if unremarkable.

Gigabyte's A320M-S2H is another very affordable and feature-rich A320 option. It's an mATX board like all the others in the roundup.

The rear I/O contains all the ports we expect, including four USB 3.1 Gen 1 ports and two USB 2.0 ports. Display connectivity is handled by one HDMI 1.4b, one VGA and one DVI-D port and a Realtek RTL8111H controller takes care of LAN duties. Audio comes courtesy of a Realtek ALC-887 controller.

Thankfully the Gigabyte A320M includes a PCIe 3.0 x4 M.2 slot that's missing from the company's H310 model in this roundup. There's only four SATA ports and two memory slots, which are the only two significant features that are missing from this budget A320 board.

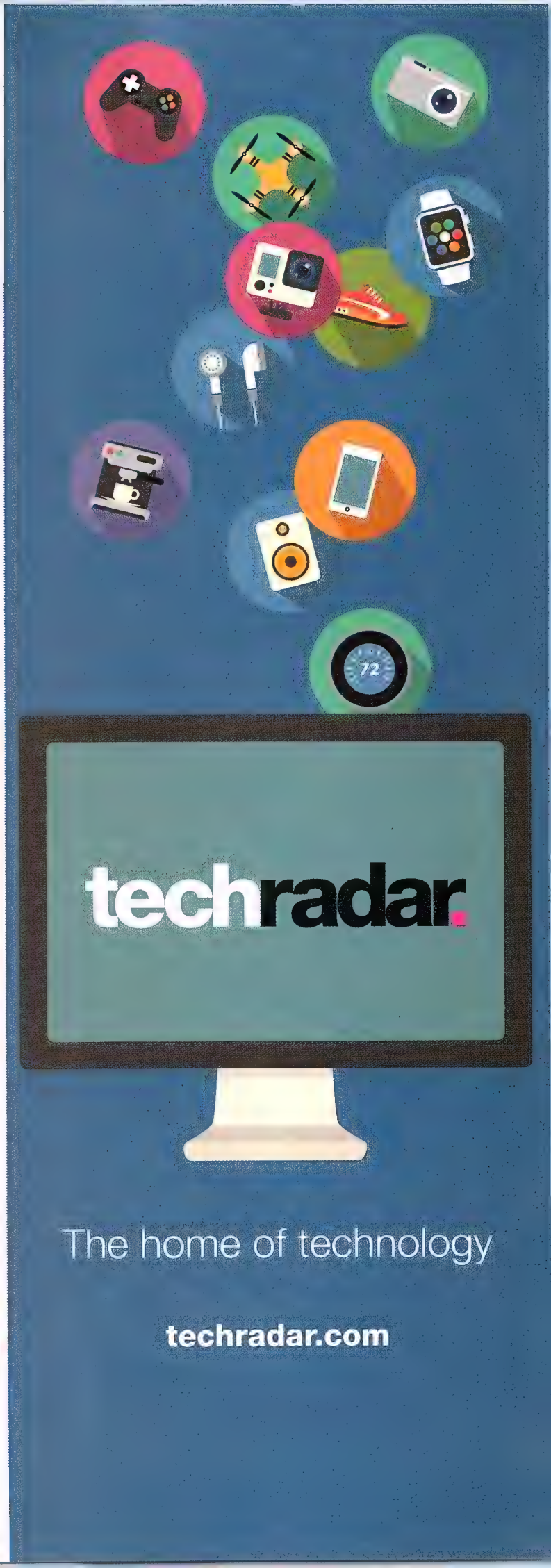
Gigabyte's H310 board performed well in the benchmark tests and so does its A320 challenger. It seems as though Gigabyte has spent time and effort to bring its budget models up to very competitive levels of performance. It leads the benchmark tests more often than not, though as we expect from a mature platform, the differences are minor.

As we noted when summarising Gigabyte's H310 model, the A320M-S2H just lacks those final couple of features that its competitors have at the same price. It doesn't make a huge difference in the grand scheme of things, but in this market, it is notable. What's impressive again is the performance of the Gigabyte A320M-S2H. If you don't need a tonne of SATA ports and don't plan to use a huge amount of RAM, then this Gigabyte A320 will provide performance to go along with value. ■

Verdict

It's déjà vu as Gigabyte's A320M S2H again performs well, but doesn't win the features battle.

★★★★☆



software

» APPS FOR ALL YOUR PLATFORMS

Windows SOFTWARE

LibreOffice

Never pay for office software again.

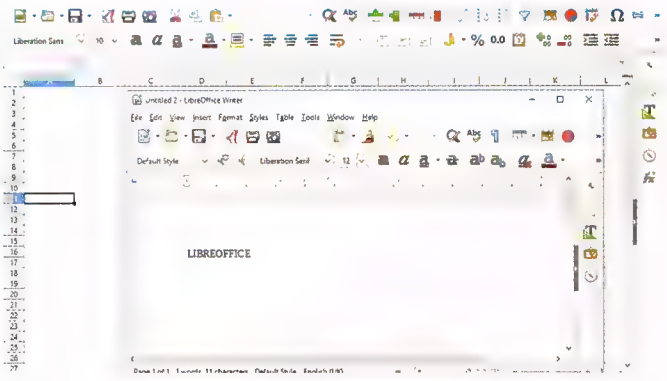
FREE | WWW.LIBREOFFICE.ORG

Everyone needs a suite of office software for everyday tasks. Microsoft Office is perhaps the best-known option, but there are also lots of free alternatives that replicate almost all the features of Word, Excel, PowerPoint and company. LibreOffice is one such package, and it's earned a reputation as one of the best free office suites around.

LibreOffice is an offshoot of the OpenOffice project, and is developed by huge team of enthusiastic coders who deliver regular updates and new features to ensure it keeps pace with premium office software.

LibreOffice contains six component programs that provide everything you need from an office suite: Writer (word processing), Calc (spreadsheets), Impress (presentations), Draw (vector graphics), Math (mathematical formulae), and Base (databases). You can save and open many different formats, including Microsoft file types (including DOC, DOCX, PPT, PPTX, and many more), which is ideal if you're collaborating with users of Microsoft Office, or if you've previously used Microsoft's suite but have decided to try LibreOffice.

LibreOffice's component programs don't have the ribbon-based interface that's been part of Microsoft Office since 2007. Instead, the open source office suite uses a more traditional system of icons and toolbars. That's no bad thing – the old-school interface means no tools are hidden behind tabs with unhelpful names, and you can navigate easily using a keyboard rather than a mouse if you prefer.



Beyond that, there's little difference between Microsoft's productivity toolkit and LibreOffice. The open source suite lacks Office's built-in cloud storage option, but that's easily remedied by installing the Dropbox desktop software, which gives you instant access to your account as though it was a folder on your PC.

LibreOffice's selection of templates might seem a little limited compared to Microsoft's, but this is easily remedied by the huge collection of downloadable options available in the project's online repository. There are also plugins to add features like advanced grammar tools, extra language packs, improved accessibility options (such as export for braille embossers), and plugins for other programs like mind-mapping tool Freemind. **Cat Ellis**

GIMP

OUR FAVORITE OPEN SOURCE PHOTO EDITOR, PACKED WITH POWERFUL TOOLS.

FREE | WWW.GIMP.ORG

GIMP (the GNU Image Manipulation Program) is a superb free photo editor, and comes with a huge array of professional-quality functions for fine-tuning snaps and creating your own artwork from scratch.

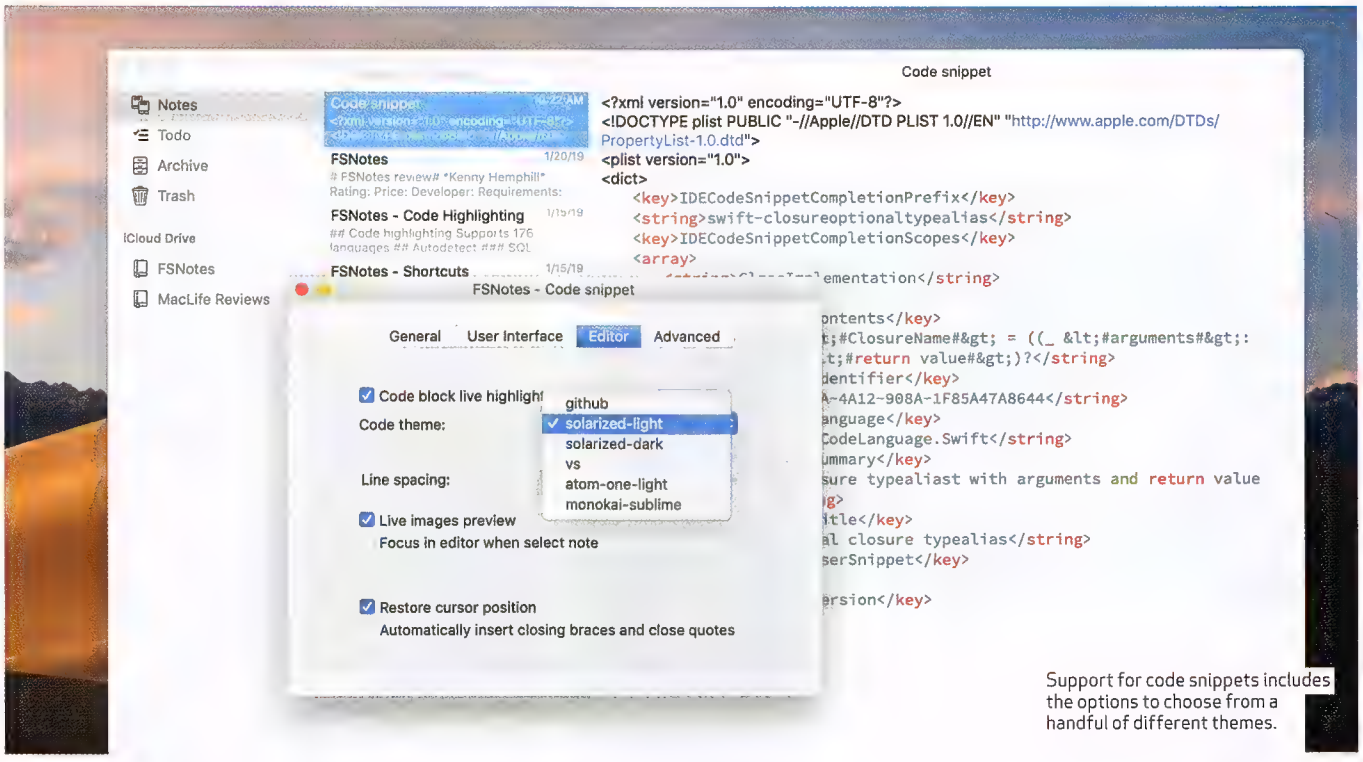
It includes layers, highly customisable brushes, filters and automatic image-enhancement tools, and support for a huge number of plugins (some pre-installed, and others available to download separately).

Its active community of contributors means it's in constant development, and any bugs are squished in short order. It all adds up to make a truly remarkable free photo editor that's superior to many commercial programs.

You can adjust every aspect of your pictures' appearance manually, or use the dozens of customisable filters and effects to achieve amazing results with just a few clicks. GIMP comes

with a huge array of user-created plugins pre-installed, and adding more is a piece of cake.

The latest version of GIMP introduces a new single-window mode, which can be toggled via the Windows menu. You can also collect several layers together into a group – very useful for complex work. **Cat Ellis** ■



Support for code snippets includes the options to choose from a handful of different themes.

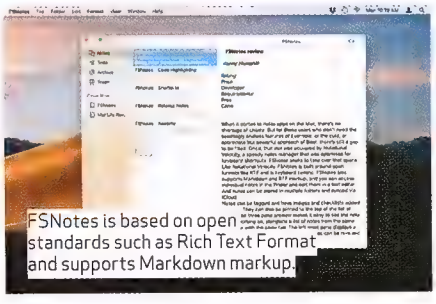
FSNotes

The speedier, simpler way to take notes on Mac.

$5.99 | FSNOT.ES | NEEDS OS X 10.11 OR LATER

When it comes to apps for note-taking on the Mac, there's no shortage of choice. But if you don't need the seemingly endless features of Evernote, and can't get on with the cute presentation of Bear despite its power, there's still a gap to be filled. Once, that slot was occupied by Notational Velocity, a speedy notes manager that was optimised for keyboard shortcuts. FSNotes now claims that space.

Like Notational Velocity, FSNotes is built around open formats like RTF and is keyboard-centric. The app also supports Markdown and RTF markup, and you can access individual notes in Finder and edit them in a text editor. Notes can even be stored within folders and synced via iCloud.



FSNotes is based on open standards such as Rich Text Format and supports Markdown markup.

Notes can be tagged and have images and checklists added to them. They can also be pinned to the top of the list of notes. The three-pane preview makes it easy to see the note you're working on, alongside a list of notes from the same search or with the same tag. The leftmost pane displays documents and also tags.

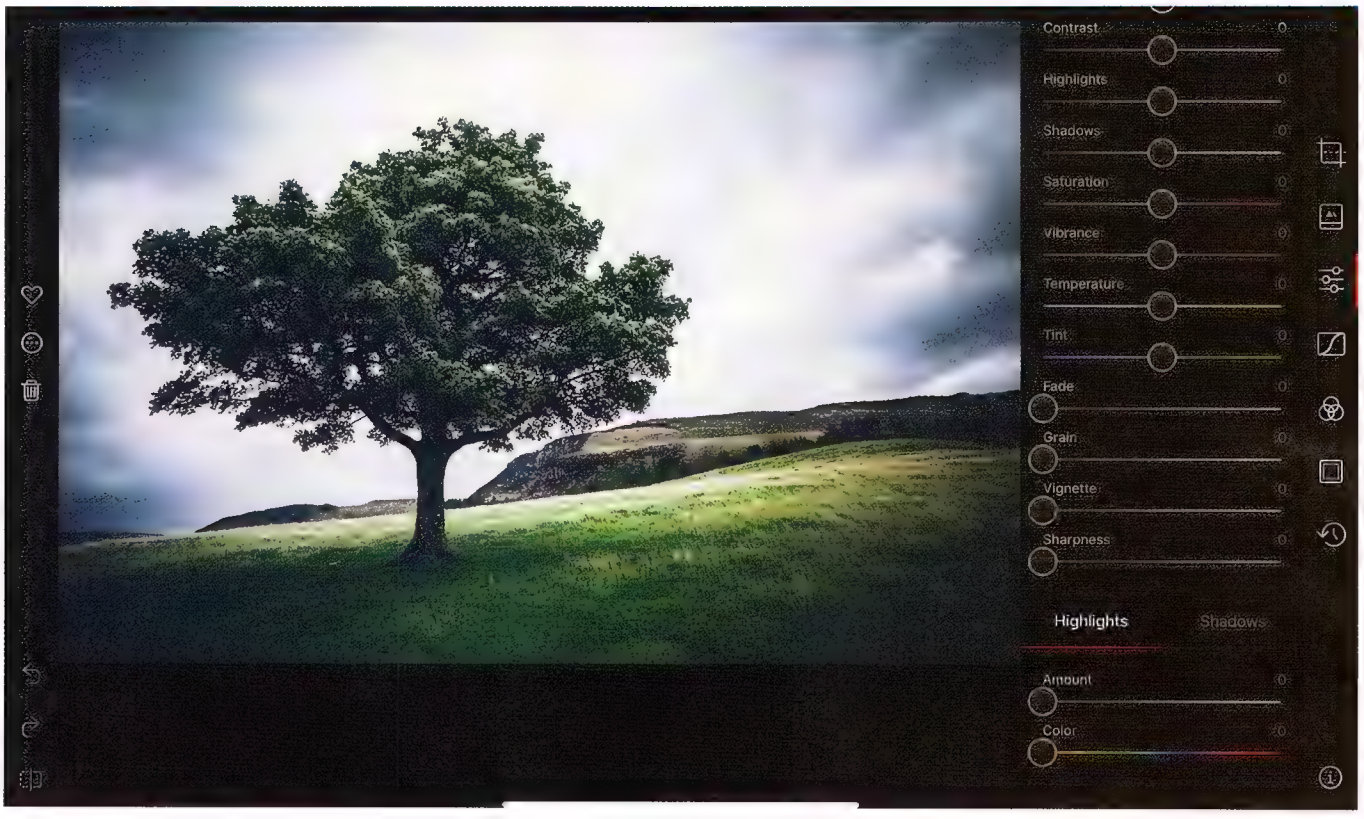
Like its ancestor Notational Velocity, FSNotes is naturally suited to coding tasks, thanks in part to its support for code highlighting, which supports 176 languages.

SPEED AND SIMPLICITY

FSNotes is a joy to use thanks to its speed and simplicity. The ability to quickly create a note, mark it up and know you can open it anywhere else – and on any Apple device, thanks to its default iCloud Drive storage – makes it the natural place to go whether you want to note down thoughts for a blog post, ideas for a podcast script, or work on a snippet of code.

It's not a writing tool, so there's no distraction-free mode or any of the additional tools you would get in an app made for writing; there isn't even a character or word count. Likewise, if you want to scan and manage receipts or documents, or snip web pages, there are plenty of other options. FSNotes is simply a note-taking and management app, and is not trying to be anything else. The app is about getting a specific job done, and it works very well indeed. Better yet, version 2.6 introduced support for Mojave's Dark Mode.

Kenny Hemphill



Darkroom 4

Desktop-class photo editing on iPad.

FREE, OFFERS IN-APP PURCHASES | DARKROOM.CO | NEEDS IOS 11 OR LATER

The evolution of the iPad means that it's become more and more suitable for digital image work. Darkroom 4 is the first version of this iOS photo-editing app to come to the iPad, which is a platform much better suited to these tasks than even the largest iPhone.

The app is free to download, with its core functionality fully accessible. More advanced tools and some pre-created filters can also be added with extra in-app purchases.

Even without adding these, Darkroom is more powerful than the iOS Photos app. Its sleek, minimalist design is easy to navigate and it reads your Photos library complete with albums, downloading photos from iCloud for editing whenever required.

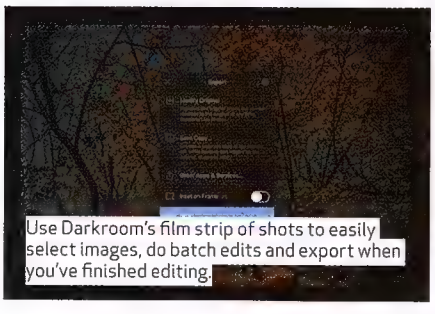
Darkroom can handle any image format that Photos can, including JPEG, PNG, HEIC, HEIF and raw. The app also boasts support for up to 120MP images – far bigger than most people are ever likely to need.

It's more an editor than a cataloguing app, so there's not much in the way of album creation and sorting, relying instead on your Photos library for that side of things. Tap an image to select it and you'll see a nice film strip of all other images in that album, as well as a section of editing icons on the right-hand edge.

EDITING FOCUS

The editing tools are powerful and well designed. Cropping is first in line, with straightening, perspective and aspect-ratio tools for modifying the frame. Then come filters, with some useful processing available alongside split toning and the ability to create and save your own custom filters.

Advanced controls for tone, colour and levels are available, and there's an RGB curve tool as well as hue, saturation and luminance for all colours. These are the same kinds of tools you'd find in pro photo-editing software such as Lightroom, and they work well, with simple sliders letting you make desired your edits.



Use Darkroom's film strip of shots to easily select images, do batch edits and export when you've finished editing.

Darkroom can read and edit Portrait mode pictures, giving access to depth editing. You can export images in various formats, as well as perform batch processing and exporting. This is a friendly but really powerful image-editing app for iPad. **Hollin Jones**

Google Play » ANDROID

Flow by Moleskine

For the love of drawing.

US$7.99 A MONTH AFTER TRIAL | US.MOLESKINE.COM/FLOW/P0483

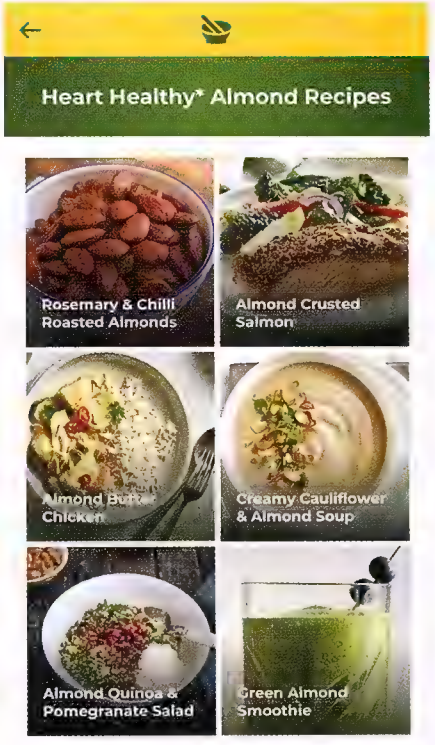
Flow, which carries the branding of the beloved Moleskine notebooks, is the sort of app that is only going to be a good fit for a select few users. It's a drawing app, essentially, one that, theoretically, allows you to create lovely art with a bunch of drawing tools and colour options. It's designed to feel tactile and real, as though you're making marks on paper with real pens, pencils and markers. To really get the most out of it, though, you're going to want proper equipment – an iPad Pro, or equivalent tablet set up for drawing with a stylus, would be preferred. If you have a digital art set up, Flow could, one supposes, give you something a bit different – the feel of pen on paper, but digital. Still, it's a lot to pay each month for an experience that will never truly replicate either the finality of drawing on paper or the versatility of most digital art platforms. There's a seven day free trial if you want to see if it's for you.

Lightbeam – screen sharing

All together, now.

FREE | LIGHTBEAM.APP

Lightbeam is an app based on the assumption that you love video calls, and that you can't coordinate with your friends, partner or family properly. The idea – everyone is thrown into a video chat where they share someone's phone screen, facilitating easier planning – is sound. But it ultimately feels like one of those apps designed to plug a gap that doesn't actually exist in most people's lives, and one that is really reliant on everyone downloading it before it can take off. This is a persistent issue on the app stores – there are so many start-up apps that fundamentally want to reshape the way we live and communicate, but don't feel like they'll ever truly fit into our lives. If you can get your friends to download Lightbeam, or if it, somehow or another, makes sense to you in a way other communication doesn't, then that's cool. But it's hard to identify the hole that Lightbeam is claiming to be able to fill.


Heart Healthy* Almond Recipes
Rosemary & Chilli Roasted Almonds
Almond Crusted Salmon
Almond Butter Chicken
Creamy Cauliflower & Almond Soup
Almond Quinoa & Pomegranate Salad
Green Almond Smoothie

Australian Almonds

It should make us want to eat nuts. It doesn't.

FREE | AUSTRALIANALMONDS.COM.AU/

Never let it be said that we aren't open to all sorts of unique app experiences. The Australian Almonds app has been spruiked heavily by the folks behind it, but there's not really a lot in it, regardless of how you feel about the second-best nut (after macadamias). At the time of writing, there's one main reason to download the app – there's a competition running on it, where you can win some free almonds by scanning the Australian Almond logo on almond packets (hint: use Google). Aside from that, the app only serves two functions – it offers a 'virtual tour' of an almond farm, and it contains some recipes. The virtual tour simply fires up your browser and sends you to **https://virtual-tours.com.au/australianalmonds/**, where you can learn that almond farming is… well, not particularly exciting. The almond-based recipes are the highlight, then, except as of right now there's only six of them. One supposes, as a completely free app designed purely to promote the goodness of almonds, there's not much reason to get upset about any of this. But you'd think it would at least prompt a craving for them, right?

Recover from any disaster

Essential Windows repair kit

:(

Get Windows up and running after any hack or crash
Check for breaches and take action • Restore damaged Windows • Breathe new life into old PCs

PAGE 40
HACK DETECTION AND RECOVERY

PAGE 46
RECOVER FROM ANY PC DISASTER

PAGE 55
YOUR PC REBORN

RECOVER FROM ANY PC DISASTER!

Become a master troubleshooter with our guide to fixing all kinds of Windows-related problems.

Disasters come in all shapes and sizes. Whether it's a sudden inability to connect to the Internet, dealing with stubborn malware infections or dealing with a non-functioning PC, we've got you covered. Over the next eight pages you'll learn how to troubleshoot those issues that leave you with sweaty palms and that sinking feeling in the pit of your stomach.

Network and Internet connection issues are debilitating, so we open by revealing how to track down the cause of your inability to get connected before showing you how to resolve it. Start by targeting the problem – is it just your PC, or a wider connection issue linked to your router or possibly the internet itself? Whatever the cause, we'll arm you with some troubleshooting techniques and tools.

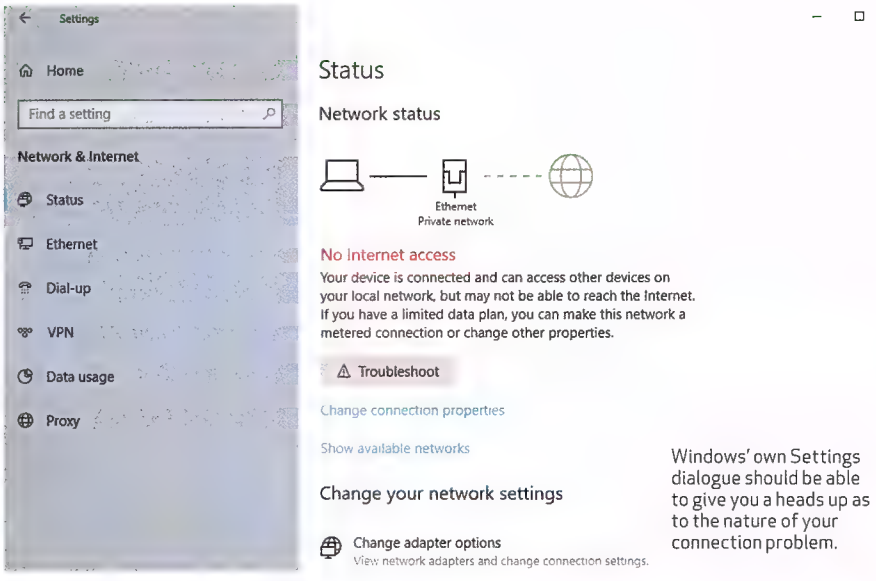
We'll then reveal how to deal with problems preventing Windows from starting – you'll learn how to set up rollback technologies to undo unwanted changes quickly and easily (including those that throw up dreaded blue screens at boot time). We'll also show you how to diagnose hardware issues and make use of recovery media to repair major Windows problems and recover data.

Last, but not least, you'll learn how to tackle stubborn malware infections – master the tools and techniques to battle nasties outside of Windows, plus gain specialised advice to take on ransomware and browser hijackers. Ready to become a master fixer? Turn the page to get started...

Resolve network issues

Can't connect, won't connect? Try these quickfire troubleshooting steps to restore your Internet connection.

Problems connecting to the Internet – or even just your local network? Start by determining what the issue is: if other devices can connect without any issues, then focus your efforts on your PC. Here, you need to first check the network icon in your Taskbar's notification area – if it's displaying a yellow exclamation mark or red cross then click for further guidance. Wireless connections may also be greyed out with an asterisk indicating other connections are 'available' – click to see if your network is listed, then try reconnecting if it is. If you're at the edge of your internal Wi-Fi network, you may find the signal's being drowned out by interference from other networks – check the step-by-step guide on the page opposite to confirm this and make the necessary change to hopefully improve your signal.



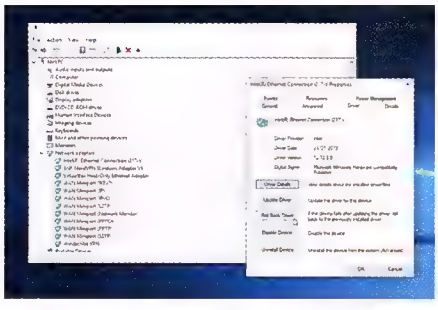
Windows' own Settings dialogue should be able to give you a heads up as to the nature of your connection problem.

BASIC TROUBLESHOOTING TIPS

Basic connectivity problems can usually be tackled by clicking the notification area's Network icon and choosing 'Network & Internet settings' to open Settings. You will see a Status diagram listing your PC, connection type (Ethernet or Wi-Fi) and what kind of connection – if any – you have.

If there's no obvious remedy – for example, check to see whether your USB adapter is plugged in, or your network cable is connected – then scroll down and click 'Network troubleshooter'. Windows will automatically attempt to diagnose the problem; if not, you'll be fed a series of questions to hopefully steer you towards a solution.

If you're having a problem with



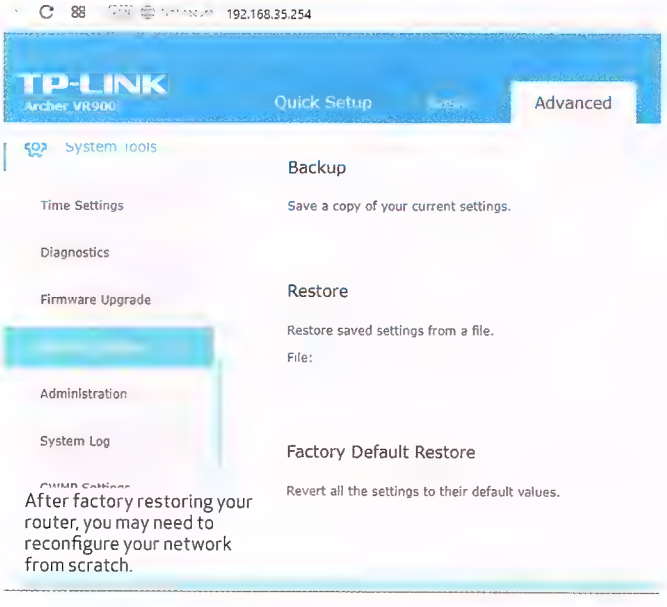
Troubleshoot your Internet connection

If your computer isn't the source of the problem, then there are two other avenues you can explore. Start with your router. Switch it off, wait 30 seconds for it to clear itself, then switch it back on. It's amazing how often this resolves network-wide issues. If you're struggling to connect anything wirelessly to the router, plug something into it using an Ethernet cable to check that still works; if it does, focus your troubleshooting on the router's Wi-Fi settings.

To log into your router through your browser you'll need to know its IP address – go to Status under Settings > Network & Internet, then click 'View your network properties' – your router's IP address is under 'Default gateway'; or check your router's manual for connection instructions.

If all other tweaks fail, try a factory reset to set things up again from scratch. Look under Advanced or System Tools.

If everyone's able to talk to each other on your network, but the internet still doesn't work, use your phone's 3G connection to Google your Internet provider's name and the word 'support' to see if you can find a status page that may determine if there's a problem their end; or to get contact details for technical support.



After factory restoring your router, you may need to reconfigure your network from scratch.

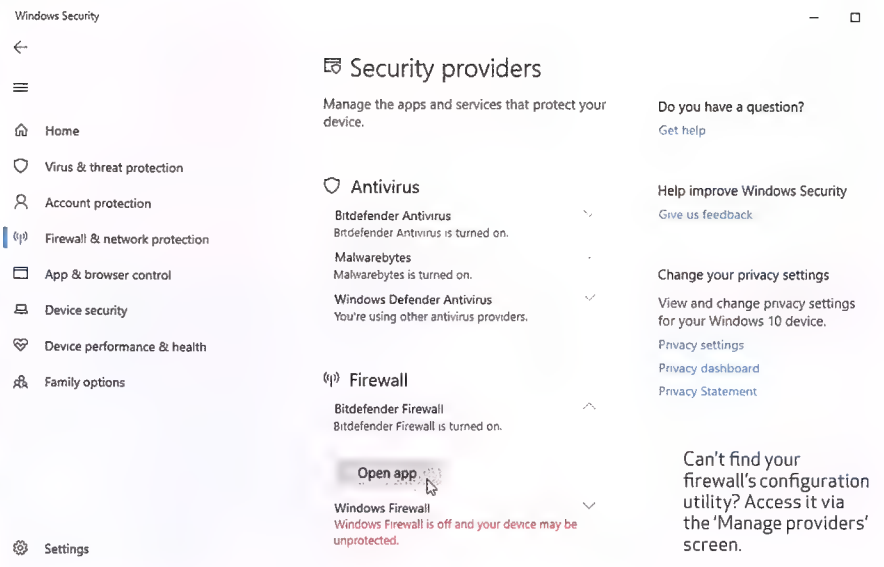
connecting to just one specific Wi-Fi network, select Wi-Fi and click 'Manage known networks' followed by your troublesome network before clicking Forget and trying a fresh connection.

Problem linked to a specific driver or Windows Update? Try reverting to the previous version – right-click Start and choose Device Manager. Double-click your network adapter and investigate the Driver tab. If 'Roll Back Driver' isn't greyed out, click it followed by a reboot.

Also make a note of the current driver's install date – if it's one supplied by Microsoft, chances are it's been superseded by the manufacturer. This involves taking a trip on a working PC to the manufacturer's website – if you strike gold, download and install that driver. If it doesn't rectify the problem, you may find that the driver comes with a tool that enables you to examine the adapter in more detail – Intel's Ethernet drivers offer a series of connectivity tests you can run, for example.

Can't identify the manufacturer? Most network devices are built into the motherboard or PC, in which case start your search there. Failing that use the information provided in Device Manager to Google for the network adapter's manufacturer and model name.

If you can't source a newer, working driver – and rolling back wasn't possible or had no effect, try removing the network adapter completely via Device Manager (click Uninstall Device on the Drivers tab, then reboot). Another drastic fix to try: browse to Start > Settings > Network & Internet > Status and click 'Network reset'.



Can't find your firewall's configuration utility? Access it via the 'Manage providers' screen.

LET'S GET TECHNICAL

Still no luck? Right-click Start and choose Command Prompt (Admin) or Powershell (Admin), then issue the following commands one at a time:

```
$ netsh winsock reset
$ netsh int ip reset
$ ipconfig /release
$ ipconfig /renew
$ ipconfig /flushdns
```

If the problem persists, see if your firewall is responsible for the connection woes. If you're relying on the built-in Windows Firewall, issue the following command at the command prompt:

```
$ netsh advfirewall set allprofiles state off
```

If this works, type firewall into the Search box and click 'Firewall & network protection', then click 'Restore firewalls to default' before switching the firewall back on again:

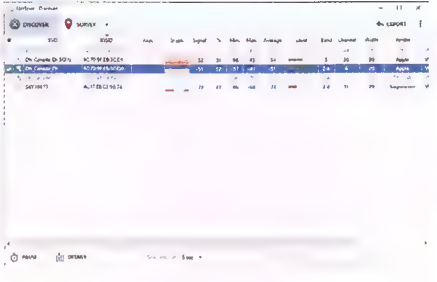
```
$ netsh advfirewall set allprofiles state on
```

If the option is greyed out, then another firewall is installed on your PC – click 'Manage protection' to find out what that firewall is, then expand its entry and click 'Open app' to access its settings. Start by looking for an option to disable the firewall temporarily to see whether that resolves your connection problem. If it does, look for options to restore your connection to its default state – or even simply reset any rules that have been applied. Whatever happens, be sure to switch the firewall back on when you're done.

Eliminate Wi-Fi interference

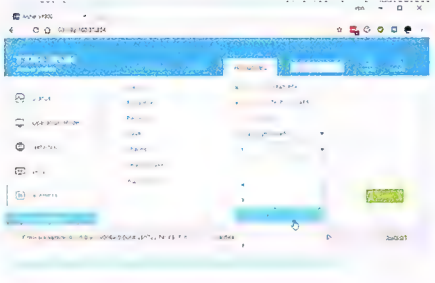
1 MONITOR WIFI TRAFFIC

If you're running Windows 10, download and install Matt Hafner's WiFi Analyzer tool from the Microsoft Store (**tinyurl.com/APC469PC**). Switch to the Analyze tab to see whether your network is affected by interference from other networks. To change your Wi-Fi channel, go to Step 3.



2 USE NETSPOT

You can get similar information if you're running Windows 7 or 8.1 by downloading and using the Netspot tool (**www.netspotapp.com/download-win.html**). Only the Discover component works in the free version, but it's enough for you to see which channels surrounding network are transmitting on.



3 CHANGE CHANNEL

If you find overlapping signals on the same channel, log into your router's configuration utility – typically through its IP address in your web browser. Once logged in, locate the Wi-Fi settings section and look for a channel setting – change this to 1, 6 or 11 based on where the signal is clearest.

Your PC won't boot

How to get your machine up and running again if it won't start or load Windows correctly.

There's nothing more sickening – or frustrating – to discover than a non-booting PC. What does it mean? A corrupt, but repairable, Windows file or setting? The end of your Windows installation? A hardware problem? Or worst of all: the imminent end of your hard drive and all the data that's on it.

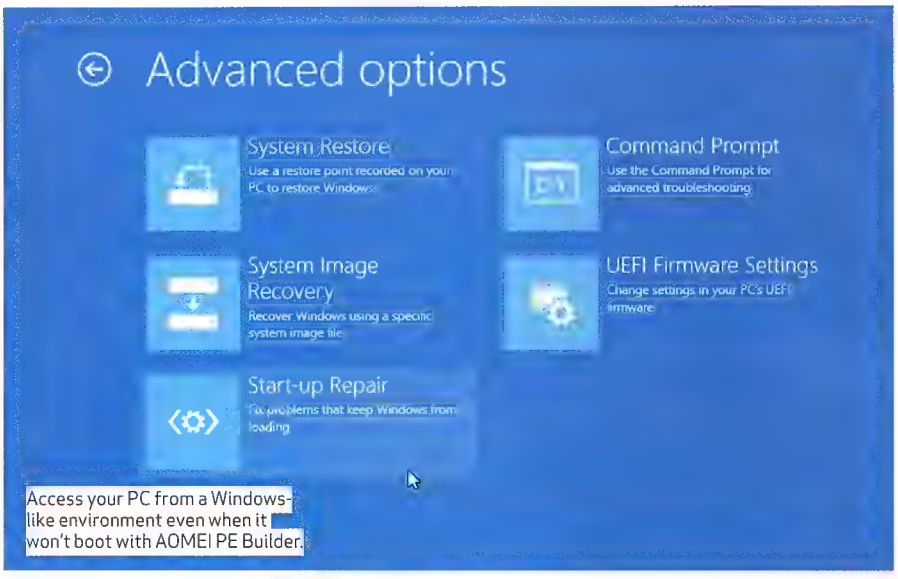
If you're lucky – and your PC boots that far – then Windows will steer you in the direction of its own repair tools. If you have Windows installation media, you can also boot from that to access similar tools. There's an automatic start-up repair tool built into Windows 8.1 and 10, or go into Troubleshoot > Advanced Options to try rolling your PC back to a time when it last worked using System Restore (see over the page).

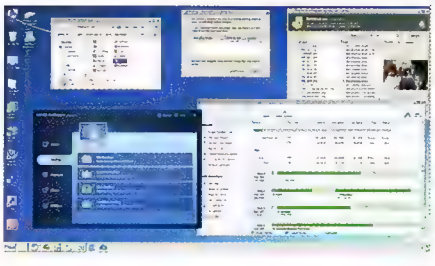
Two final options if you use Windows 8.1 or Windows 10 are 'Refresh' and 'Reset'. 'Refreshing' your PC enables you to perform a repair install of Windows, which could get things running again without affecting your files.

OTHER RECOVERY OPTIONS

An easier, and potentially more effective, solution lies with the brilliant Lazesoft Recovery Suite (**www.lazesoft.com/lazesoft-recovery-suite-free.html**). Not only does it offer a wider array of repair tools, but it can also recover data before you pull the plug and reinstall from scratch. The step-by-step guide opposite shows how to use it.

If Lazesoft can't get your PC working again, but you don't yet want to give up on your installation, you need AOMEI PE Builder (**www.aomeitech.com/pe-builder.html**). This creates a recovery environment that closely emulates the Windows interface. It incorporates a partition manager, backup/restore tools and several portable tools including a web browser for researching your problem further on the web. You can also add your own portable apps for even more functionality, such as adding LibreOffice Portable (**www.libreoffice.org/download/portable-versions/**) for editing documents while you attempt to troubleshoot your problem. After downloading and installing AOMEI PE Builder, it'll step you through the process of preparing – and then creating – your perfectly crafted recovery disc. From here, boot from the tool (see Step 2 of the step-by-step guide) to access your personalised – yet familiar – recovery environment.


Advanced options
System Restore
Use a restore point recorded on your PC to restore Windows
Command Prompt
Use the Command Prompt for advanced troubleshooting
System Image Recovery
Recover Windows using a specific system image file
UEFI Firmware Settings
Change settings in your PC's UEFI firmware
Start-up Repair
Fix problems that keep Windows from loading
Access your PC from a Windows-like environment even when it won't boot with AOMEI PE Builder.


See Troubleshoot > Advanced Options on your installation media for Windows 10 repair tools.

FIX HARDWARE PROBLEMS

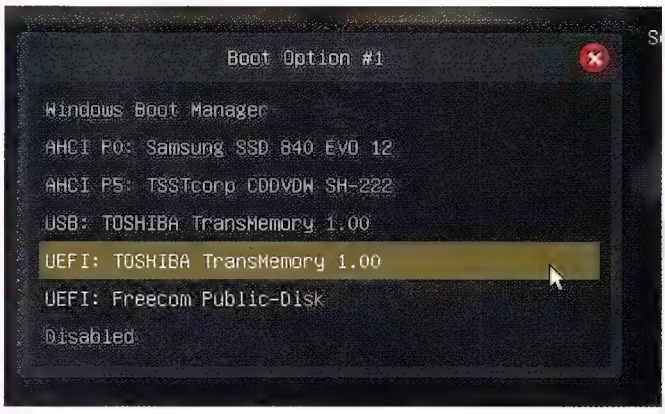
Lazesoft is your go-to solution if your PC at least powers on and gets past the initial setup screens. It'll help determine if your hard drive is still there (and recognised), but what if the problem is deeper and you can't even get to the initial loading stage? Start with the obvious checks – if nothing happens when your PC powers on, check the cable and any power switch on the back. Still nothing? It may be the fuse, cable or power supply unit that needs replacing.

If power appears to come on – listen out for fans and hard drives spinning, the next stage is the so-called POST (Power On Self Test). This checks the hardware at a basic level, and you may hear a series of beeps, see an error code on-screen or – after opening your case – discover lights on the motherboard if a problem is encountered. Interpreting these will diagnose the problem and reveal the remedy – check your motherboard or PC's manual or the manufacturer's support pages for advice, or visit **www.computerhope.com/beep.htm** for some useful generic guides.

Many errors are down to faulty components, but some may simply be dislodged (the dreaded 'chip creep' whereby processors, graphics cards or RAM work themselves free over time). This can be fixed by opening your case and checking the items are securely in place. No luck? Try disconnecting all the drives and removing all expansion cards (except any graphics card, of course) to see if it solves the problem. No? Try removing the graphics card – if your motherboard has onboard graphics, plug the monitor into its socket instead.

Often stripping your PC back to the bare essentials is enough to get it working again. You can try reconnecting everything to see if everything now works okay, or reconnect one at a time until the problem reoccurs. If you can pinpoint the faulty component, look to replace it; otherwise you are likely to need professional help.

Recover your PC using Lazesoft

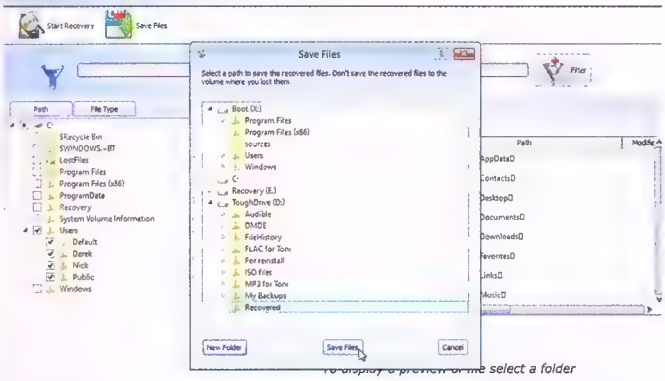


1 CREATE RECOVERY MEDIA

Download and install the free version of Lazesoft Recovery Suite Home Edition from **www.lazesoft.com** on to a working PC. Once done, launch the program and choose 'Burn CD/USB Disk'. Work through the wizard, choosing your afflicted PC's version of Windows when prompted.

2 BOOT FROM LAZESOFT CD/USB DRIVE

Insert the USB flash drive or CD into your non-booting PC and power up. If the Windows Boot Manager screen appears, choose 'Lazesoft Live CD' to continue; if not, press the reset button and look for an option to access a boot menu – choose this and select your recovery media to boot from.


Start Recovery
Save Files
Select a path to save the recovered files. Don't save the recovered files to the volume where you lost them.
New Folder
Save Files
Cancel

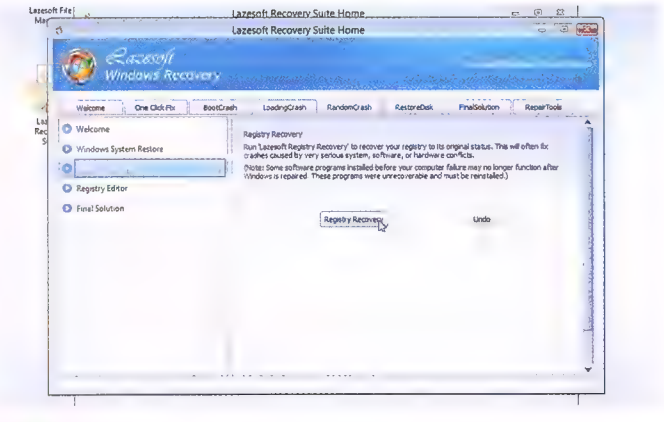
To display a preview of the file select a folder on the left and click the file in the list.

3 SCAN FOR DATA FILES

If your data files are on the same drive as your Windows installation, and they've not been backed up recently, step one is to copy them to another drive for safekeeping. Choose 'Data Recovery' followed by Fast Scan and the drive containing your files. Click 'Start Search'.

4 RECOVER FILES

Once the search is complete, expand drive C on the left to reveal its contents. Most data files are stored inside your personal user folder – tick Users to select everything inside. Next, click Save Files, select a suitable folder on your backup drive and click Save Files to transfer them across.



5 START REPAIRS

You may want to take a fail-safe copy of your PC's entire drive before attempting repairs – click Disk Image & Clone from the main screen to do so. Once that's completed, click Windows Recovery to start repairs. Make sure your version of Windows is selected, then click OK to continue.

6 FIND A FIX

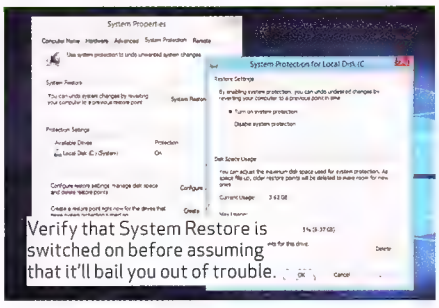
Start with the One-Click Fix Crash Solution – this will attempt to diagnose the problem and attempt repairs, and if it fails, you'll be able to roll back to attempt other repairs. These 'alternative fixes' are more specific, but clearly labelled, and include handy shortcuts to Windows' repair tools as well.

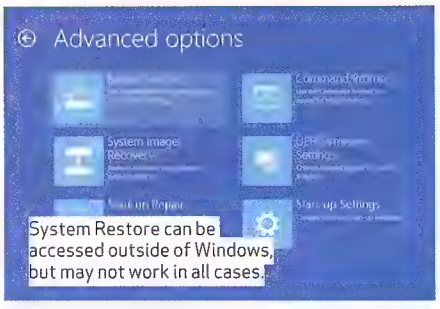
Roll back your PC

Avoid future disasters by giving yourself the ultimate fall-back plan: the ability to undo changes to your PC.

Some PC disasters are unavoidable – hardware failure, for example, or a botched Windows Update. But many others are self-inflicted, from rushing through a program installation or becoming too impatient while your PC grinds through an intensive task.

If you regularly back up your entire Windows system using a drive-imaging tool, you have one way to roll back the changes, but it's a slow, process that can wipe out personal files and cost you days or even weeks of lost work. Thankfully, there are more elegant ways to undo unwanted changes to your PC.


Verify that System Restore is switched on before assuming that it'll bail you out of trouble.



System Restore can be accessed outside of Windows, but may not work in all cases.

USE SYSTEM RESTORE

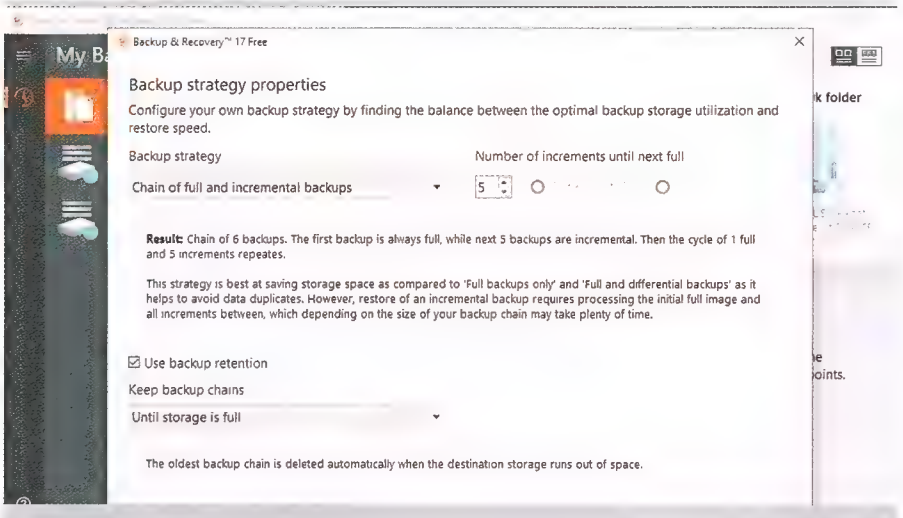
System Restore is a tool built into Windows that's been designed to help minimise damage caused by unwanted changes to your system. System Restore is enabled and switched on by default in Windows 7 and 8.1, but Windows 10 switches it off after every major update, and flushes all previous Restore points in the process.

To check whether System Restore is currently running on your PC or not, type system restore into the search box and click 'Create a Restore point'. If the drive is unprotected, select it (your Windows drive is typically drive C or marked System) and click Configure. Select 'Turn on system protection', choose how much space to allocate to Restore points (5GB should be adequate) and click OK followed by Create to create your first Restore point.

From this point on, Windows will automatically take Restore points before installing new Windows Updates, unsigned drivers or programs using the Windows Installer. It will also take Restore points after seven days if none have been created in the interim.

Note, though, that not all files are monitored with System Restore – it's no substitute to either backing up your data or taking periodic drive images (see the 'Take a fail-safe backup' box below). It's also unsuitable for undoing malware infections. It does come into its own should you run into problems caused by a new program or update. You can access it from inside Windows – open the 'Create a Restore point' dialog box, then click the System Restore button – or access it through the recovery start-up menu should Windows fail to load (look under Troubleshooting > Advanced Options).

Try the recommended restore point first, or tick 'Show more restore points' to see them all. Click 'Scan for affected programs' first to see what will be lost when you roll back.


Backup & Recovery™ 17 Free
Backup strategy properties
Configure your own backup strategy by finding the balance between the optimal backup storage utilization and restore speed.
Backup strategy
Chain of full and incremental backups
Number of increments until next full
5
Result: Chain of 6 backups. The first backup is always full, while next 5 backups are incremental. Then the cycle of 1 full and 5 increments repeates.
This strategy is best at saving storage space as compared to 'Full backups only' and 'Full and differential backups' as it helps to avoid data duplicates. However, restore of an incremental backup requires processing the initial full image and all increments between, which depending on the size of your backup chain may take plenty of time.
Use backup retention
Keep backup chains
Until storage is full
The oldest backup chain is deleted automatically when the destination storage runs out of space.

Take a fail-safe backup

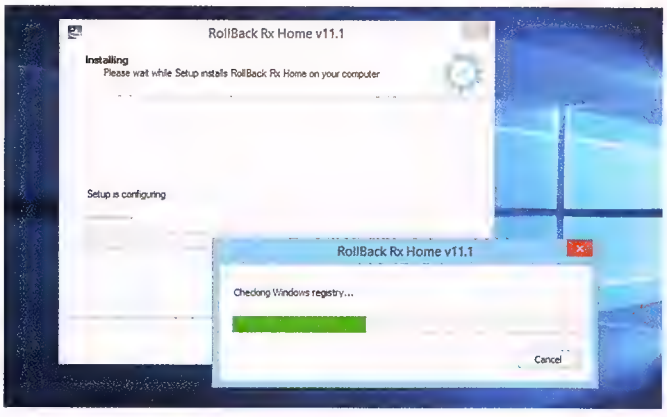
Neither System Restore nor Rollback RX are a substitute for taking drive images using tools such as Macrium Reflect Free (**www.macrium.com/reflectfree.aspx**) or Paragon Backup & Recovery (**www.paragon-software.com/free/br-free**). Both of these free tools enable you to take periodic fail-safe backups of your entire Windows setup – everything is included, and because your backup is stored on a separate physical drive, you're also protected against drive failure. Set up a weekly differential (Macrium) or a daily incremental (Paragon) schedule to minimise disruption and data loss just in case you ever need to restore from either app.

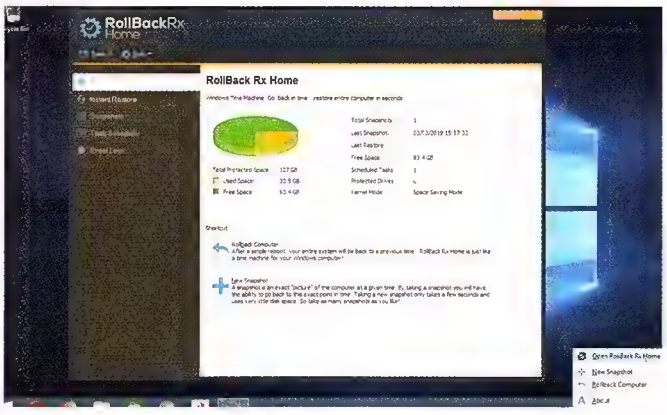
SYSTEM RESTORE ALTERNATIVE

RollBack Rx Home is a free, fast and more complete alternative to System Restore. All changes on the drive are recorded, and restoring a snapshot is as fast as restarting Windows. You can also restore snapshots outside of Windows – which comes in handy when you can't boot into Windows. If you frequently test apps or find yourself running into trouble, you'll find RollBack Rx much more reliable than System Restore.

Because RollBack Rx Home makes major changes to your PC, take a drive image before you begin. Then follow the step-by-step guide on the page opposite to set it up, take snapshots and restore as and when necessary. We recommend switching off System Restore if you go down the RollBack route – doing so will save drive space.

Roll back with RollBack



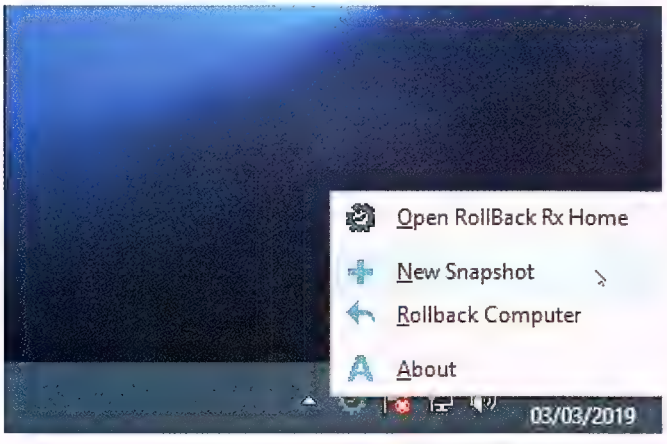


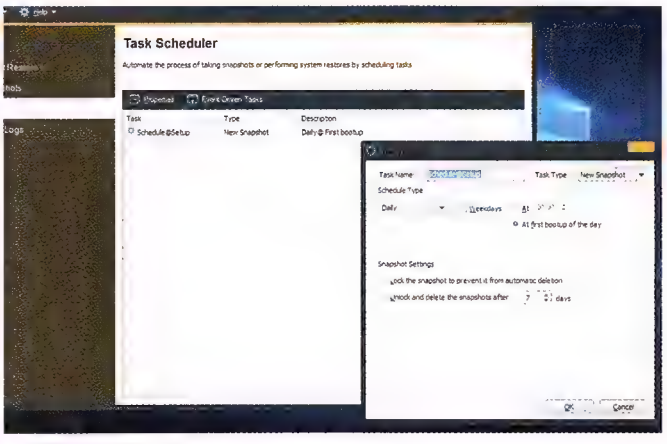
1 INITIAL SETUP

Download Rollback Rx Home from **tinyurl.com/APC69PC2** – fill in the form to receive a link by email. Once downloaded, double-click the installer and follow the prompts. Once complete, reboot when prompted. You'll see RollBack Rx set up its emergency tool, then Windows will reload.

2 ACCESS CONFIGURATION

RollBack Rx will automatically start with Windows – look for its Taskbar Notification area icon. Roll your mouse over it and you'll see it's already taken its first snapshot. To review this, right-click the icon and choose 'Open RollBack Rx Home' to access the main summary screen.



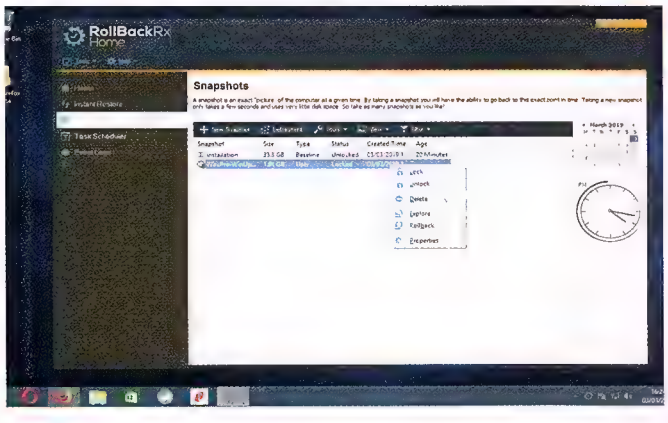


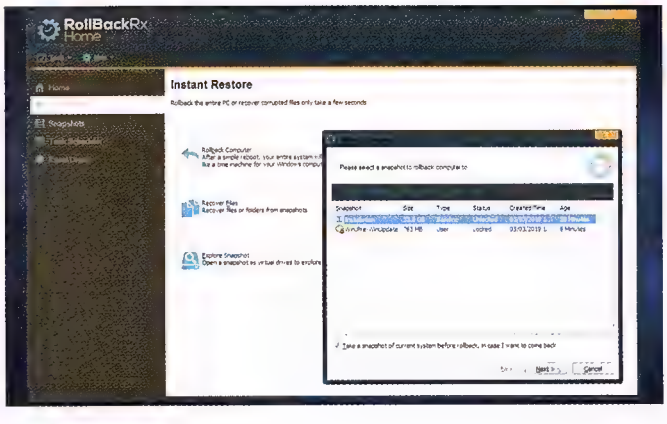
3 CREATE SNAPSHOT ON DEMAND

You can easily create new snapshots on demand – right-click the RollBack icon in the Taskbar and choose New Snapshot just before installing a program, for example. Give it a name, description and choose whether to lock it to prevent it being automatically deleted. Click 'Next' to create it followed by Finish.

4 AUTOMATIC SNAPSHOTS

Open RollBack Rx's main menu and select Task Scheduler on the left to view automatic snapshots – they're taken daily when you first start your PC, and whenever a setup.exe installer is run. You can't change these in the free version of RollBack Rx, but these settings are adequate for most.





5 MANAGE SNAPSHOTS

Select 'Snapshots' in the left-hand menu to view all the current snapshots. You can remove unwanted ones by right-clicking and choosing Delete. RollBack Rx Home only keeps seven snapshots, so protect important ones by choosing Lock. Click 'Defragment' to defrag the hidden partition containing your snapshots to improve performance.

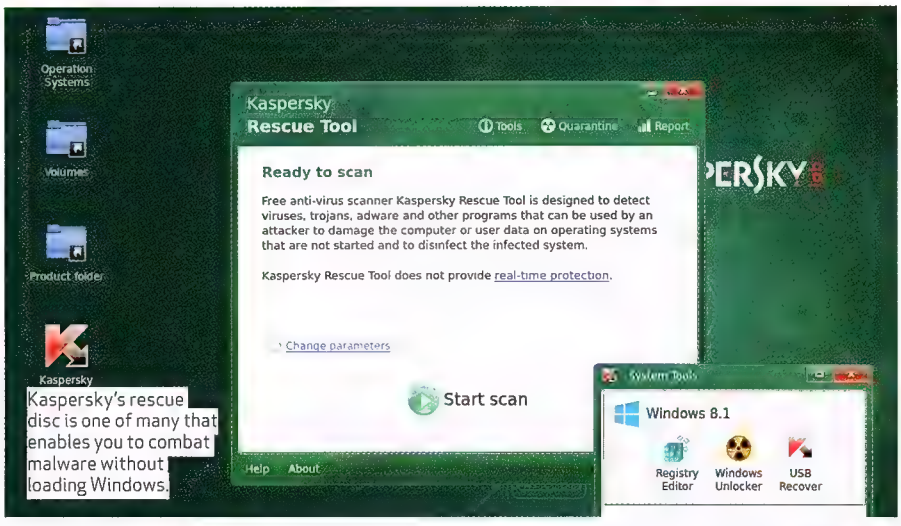
6 RESTORE YOUR PC

You can manually roll back to a snapshot simply by selecting Instant Restore > Rollback Computer. Select your desired snapshot – a snapshot of your current setup is automatically taken so you can undo the change if you wish. Click 'Next' > Restart and your system will roll back after Windows has rebooted.

Stop malware in its tracks

Plagued by trojans, browser hijacks and other nasties? Read on to discover how to fight back.

There's no need for recriminations – getting caught out by malicious software happens to the best of us. The question is, how do you deal with it? Let's dive in and look at detecting and removing stubborn infections from malware to browser hijackers. First, open your security software, make sure it's fully up to date and run a full (not quick) scan. If any security alerts pop up, review them carefully for false positives, but if you're in any doubt, allow your anti-malware tool to zap the file into quarantine or attempt a full-blown removal. Reboot when done, then scan again to verify the infection is gone.



Kaspersky's rescue disc is one of many that enables you to combat malware without loading Windows.

REMOVE DEEP INFECTIONS

You may find some infections keep hanging around – give your anti-malware tool two or three attempts to scrub the infection clean, but if it's still there, reboot into Safe mode: click Start › Settings › Update & Security › Recovery and click 'Restart now' under 'Advanced start-up'. From here, navigate to Troubleshoot › Advanced Options › Start-up Settings. Click 'Restart' and press [5] to select 'Enable Safe Mode with Networking'.

Your anti-malware tool should now be able to update itself fully and deal the infection – again, reboot and keep scanning until no traces of the infection remain. If you're still unable to shift the infection – or you're plagued by suspicious behaviour despite your software's insistence that all is well, then try these additional tools in Safe mode.

Emsisoft Emergency Kit (**www.emsisoft.com/en/software/eek/**) is a portable tool that combines two anti-malware engines, while VIPRE Rescue (**www.vipre.com/support/rescue/**) can help clean up after nasty

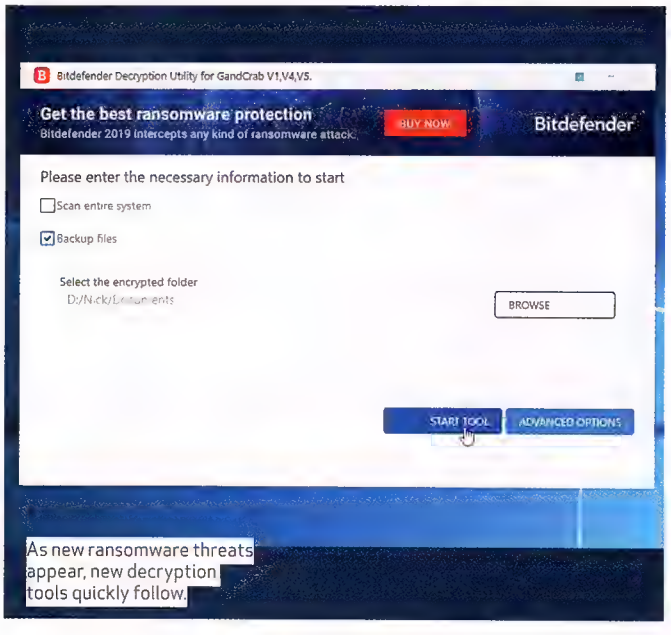
infections. Another tool worth trying is Malwarebytes Anti-Malware (**www.malwarebytes.com**) – the free version

How to combat ransomware

Ransomware is a nasty piece of malware where hackers encrypt all or part of your PC's main drive and demand a ransom for the key required to unlock it. Hopefully you have a recent backup to fall back on if all else fails, but all may not be lost even if this isn't the case.

There are two types of ransomware: some simply target your data, while others lock you out of your PC. Dealing with the former type involves removing the underlying infection first using your anti-malware tool. Once done, visit **www.nomoreransom.org/en/decryption-tools.html** for a comprehensive list of ransomware types and tools to deal with them. Here you'll find links to tools from reputable companies such as AVG, Bitdefender or Kaspersky.

If you find yourself locked out of your PC, try Trend Micro's free Ransomware Screen Unlocker Tool (**https://bit.ly/trendransomware**), which can be run from Safe mode or directly booted from USB media (create the media on another computer if you're locked out of your own PC) to beat the infection.



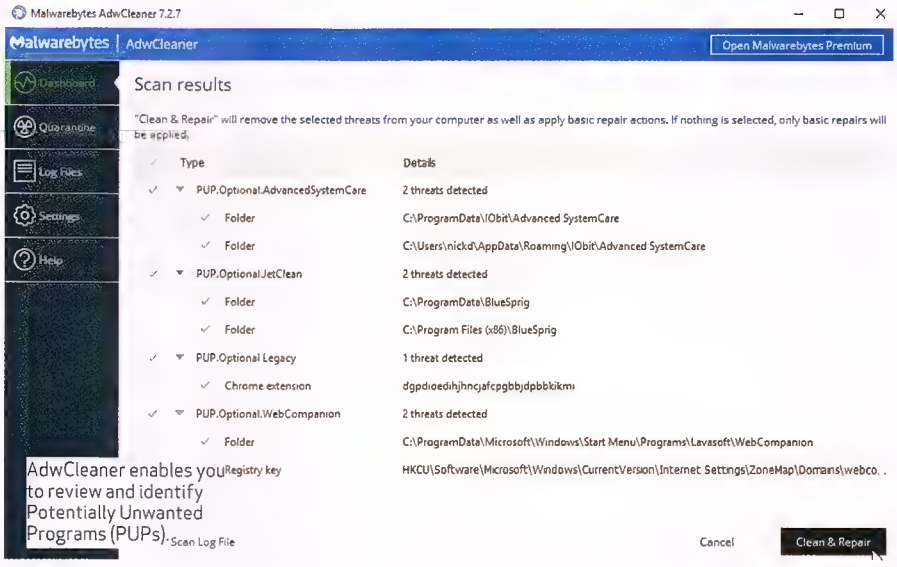
As new ransomware threats appear, new decryption tools quickly follow.

is often used as a secondary form of protection because it targets threats other tools ignore.

Often, however, malware cripples Safe mode – it's surprisingly easy to do, simply by corrupting a few Registry entries. Fixing that problem comes later, but for now you need access to a second PC to enable you to create an anti-malware rescue disc or USB flash drive. You boot directly from this, bypassing Windows completely, and let its onboard scanners find and deal with the threat while it's completely dormant.

Many anti-virus vendors, including Norton, Kaspersky and AVG, offer free rescue discs, some easier to find than others. For example, Bitdefender's rescue disc is buried away in a knowledgebase article – go to **www.bitdefender.com/support/how-to-scan-your-computer-with-bitdefender-rescue-cd-1263.html** for instructions on downloading and running it.

Other rescue discs work in a similar way – Google your chosen vendor and add the phrase rescue disc to see what comes up. Any downloaded ISO file can be burned directly to CD: right-click the ISO file and choose 'Burn disc image'. Alternatively, try creating a bootable USB flash drive using a tool such as Etcher (**www.balena.io/etcher/**).



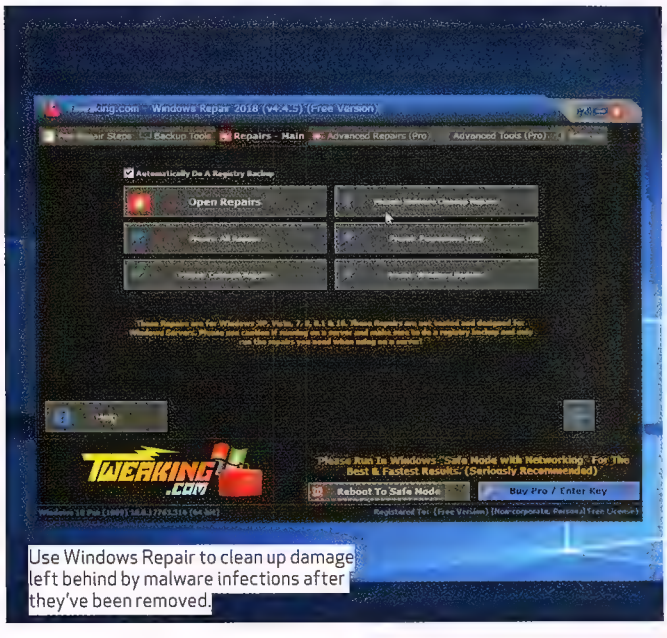
AdwCleaner enables you to review and identify Potentially Unwanted Programs (PUPs).

BANISH BROWSER HIJACKS

One particularly annoying – if not necessarily devastating – type of infection is the so-called 'browser hijack'. These can manifest themselves in various ways, from redirecting your home page and default search engine, to unwanted pop-ups, browser toolbars and even browser redirects from legitimate to fake websites. In most cases, your anti-malware software should provide a degree of protection against these – if you're a Malwarebytes user, upgrade to premium ($59.99 per year) for real-time protection. Free users should simply run a scan – it'll quickly spot hijacks and try to remove them.

If you know the origin of the hijack, you may be able to remove it even if your anti-malware software can't: check your browser add-ons for suspicious entries and remove them, or explore Start › Settings › Apps to uninstall any unwanted programs. If you're not sure, try IObit Uninstaller (**www.iobit.com/en/advanceduninstaller.php** – be sure, though, to resist its own attempts to push other IObit products on you during installation). Expand 'Programs' and select Bundleware to view all programs that installed additional components alongside themselves – in many cases these are legitimate extras, but Potentially Unwanted Programs (or PUPs) may show up here. Once done, select 'Toolbars & Plug-ins' to review and remove any suspicious-looking browser add-ons and toolbars – IObit will flag these as untrusted or unknown.

Still plagued by unwanted pop-ups and other elements? Try Malwarebytes' AdwCleaner portable tool – download and run it from **www.malwarebytes.com/adwcleaner** where you'll find a similar user interface to the main Malwarebytes program. Click 'Scan Now' and see what it finds, then take the appropriate action.


Tweaking.com - Windows Repair 2018 (v4.4.5) (Free Version)
Repairs - Main
Advanced Repairs (Pro)
Advanced Tools (Pro)
Automatically Do A Registry Backup
Open Repairs
TWEAKING .COM
Please Run In Windows "Safe Mode with Networking" For The Best & Fastest Results (Seriously Recommended)
Reboot To Safe Mode
Buy Pro / Enter Key
Use Windows Repair to clean up damage left behind by malware infections after they've been removed.

Cleaning up after infections

You've removed all the infections from your PC, but they've left behind damage. Safe mode remains crippled, you've been locked out of folders due to permissions issues and you may find that your network and Internet connections are no longer working in the way they should. Thankfully, there are several tools that can help you repair some, if not all, of the damage.

Start with the Windows Repair Tool (**www.tweaking.com**) – If you can, reboot into Safe mode and skip to the following paragraph; if not, switch to the 'Repairs – Main' tab, click Open Repairs and choose 'I understand the risks'. Untick 'All Repairs', then tick '23 – Repair Windows Safe Mode' and click Start Repairs. After doing so, Safe mode should be enabled, allowing you to reboot into it. Once in Safe mode, return to the 'Repairs – Main' tab and choose 'Preset: Malware Cleanup Repairs', which will automatically select most repairs linked to malware infections. Again, click Start Repairs and hopefully the worst of the damage left behind will be fixed. Try fixing network-related problems with Complete Internet Repair 5 (**www.rizonesoft.com/downloads/complete-internet-repair/**) – if this fails, you may have more successful with NetAdapter Repair All In One (**https://sourceforge.net/projects/netadapter/**) instead. ■

DON'T PANIC

Find out if your accounts have been hacked, and what you should do about it, with Nick Peers.

If there's one thing guaranteed to bring you out in a cold sweat, it's the thought of being hacked. Over the years we've armed you with all the tools you need to protect your PC against viruses, hackers, and other forms of malware, but it's an ever-evolving battle. These days, most threats are behavioural – they rely on scammers catching you out with emails harbouring malicious attachments and links to fake websites.

Even if you're wise to all this, there's one massive weak link: online accounts. Many of us have signed up for dozens of accounts, and secured them with short, memorable, and often reused passwords that are easy to hack. Worse still, even if you've not personally given up your password, chances are at least one online service you use has been hacked, exposing your data to the so-called dark web.

Don't believe us? In January, the Have I Been Pwned website released Collection 1, a compilation of over 770 million compromised online accounts, including login details and passwords. The site offers a search tool that lets you see if you're on the list. And unless you're very lucky or barely use online services, you're almost certainly going to appear.

Don't panic. In this feature, we reveal everything you need to know to find out if you're on the list, what to do if you are, and how to lock down your accounts with free tools and online savvy. Let's get a move on.

If you have already been hacked, skip to the Emergency Actions section. If you've come to this feature having read up on the recent releases of breached data, let's look at a couple of ways to tighten up your online security.

First, now is the time to use a virtual private network (VPN). Free and paid-for services are available – see the box below. Connecting through a VPN masks your true location as determined by your public IP address – simply connect through the closest location to your own. Why do all this? Because if the Have I Been Pwned website is ever compromised, you don't want to be leaving tell-tale traces of your presence.

VPNs encrypt the content you send and receive to the Internet, but don't hide the data you send to the websites you visit, and you still leave a record of where you've been on your PC. Ensure nothing is recorded by opening a private or Incognito window in your browser – disable browser extensions, too, as some record information from private browser windows.

CHECK FOR BREACHES

With a private browsing window open, visit **https://haveibeenpwned.com** and enter your primary email address, before clicking the 'pwned?' button. After a pause, you're shown the results.

These are split into two: breached sites and 'pastes'. Breached sites include individual sites (such as LinkedIn from 2016 and Dropbox from 2012) and compilations, such as Collection #1. 'Pastes' are where hacked usernames, email addresses, and other information have been placed into the public domain on other websites. Scroll down to read about each breach – it provides a title, summary, and the information that was exposed.

Many of these breaches should have already been brought to your attention; any company that's been hacked should email its users, and some went further by forcing all users to reset their passwords. In these cases, the findings are historic, and confirm much of what you already knew.

Many of us have more than one email account these days, so perform searches for all the accounts you possess (including web-based services such as Gmail and Outlook.com). Also include any old addresses no longer in use, particularly if you're still using them to log in to certain services.

Have I Been Pwned has an even more important tool. Open a new private tab, and go to **https://haveibeenpwned.com/Passwords**, where you should enter all those passwords you frequently use, and be appalled to discover most of them have been compromised. Even if you haven't been personally targeted, the chances are that someone else used the same password, and was hacked.

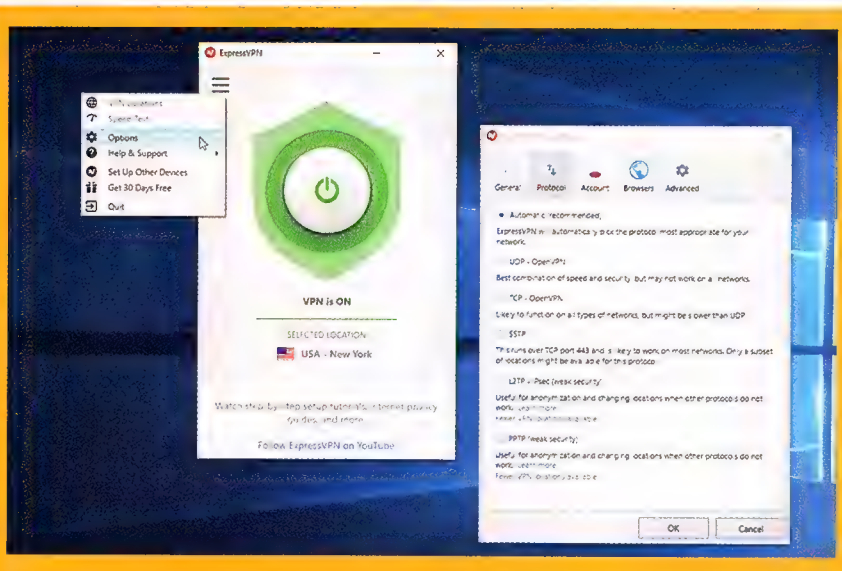
Make a note of them all. You should now have a list of accounts and passwords that have been compromised at some point. These need addressing as a matter of urgency, if you haven't already done so.

A NEW APPROACH TO PASSWORDS

Here's the big takeaway from Have I Been Pwned: You can no longer rely on a handful of short, easily guessable, and frequently reused passwords to secure your online accounts. But how do you square the circle of using long, complex passwords, without locking yourself out of your accounts because you mislay or can't remember them?

The answer lies with a password manager – an online tool that generates and remembers all your login details for you, locked in an encrypted vault behind a single master password, the one password you absolutely must remember going forward.

Password managers offer a Windows app and browser extensions to make it



Set up a VPN

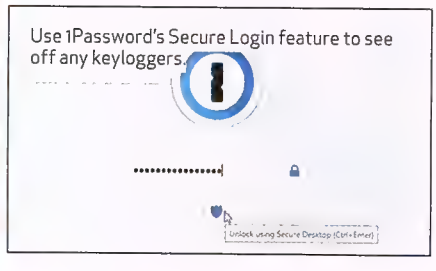
We're big fans of virtual private networks (VPNs), and for good reason. They mask your identity and encrypt all data sent and received over the internet, making them an essential tool if you regularly browse on unencrypted wireless networks, such as public hotspots. VPN providers are ten-a-penny, and there are three we recommend. All work on mobile as well as desktop, letting you cover all your devices, and they all use the tightest forms of encryption.

The crème de la crème is ExpressVPN (**www.expressvpn.com**), which checks all the boxes for security, ensuring no personally identifiable traces of your browsing activity are recorded. ExpressVPN has over 2,000 servers spread across over 140 cities in over 90 countries, making it useful for accessing geo-restricted content, too.

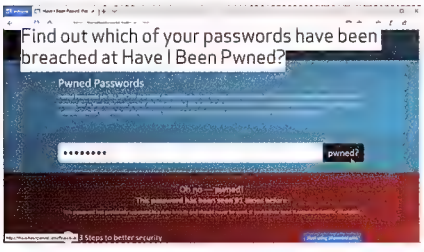
The process of encrypting and decrypting your Internet traffic, plus the extra mileage it travels to pass through your VPN's servers, normally has a measurable impact on performance, but ExpressVPN is so quick, that there's no noticeable effect.

The issue with ExpressVPN is cost: US$12.95 a month, or US$99.99 for a year (although at time of writing, you can get 15 months for the price of 12). If that's off-putting, a good substitute is NordVPN (**www.nordvpn.com**), which offers three years for just $107.55 (that's $2.99 a month). It's slower than ExpressVPN, and covers fewer territories, but has over 5,000 servers and can be used on six devices at once (it's just three with ExpressVPN).

If you'd rather not pay at all, many services offer cut-down free versions, with a monthly bandwidth cap and limited selection of servers. The most generous of these is Windscribe (www.windscribe.com), which offers 10GB of free bandwidth a month, and enables you to connect through a wide range of countries for the privacy-conscious.



Donate
Read in depressing detail where your email address has been compromised.
Breaches you were pwned in
A "breach" is an incident where data has been unintentionally exposed to the public. Using the 1Password password manager helps you ensure all your passwords are strong and unique such that a breach of one service doesn't put your other services at risk.
Anti Public Combo List (unverified): In December 2016, a huge list of email address and password pairs appeared in a "combo list" referred to as "Anti Public". The list contained 458 million unique email addresses, many with multiple different passwords hacked from various online systems. The list was broadly circulated and used for "credential stuffing", that is attackers employ it in an attempt to identify other online systems where the account owner had reused their password. For detailed background on this incident, read Password reuse, credential stuffing and another billion records in Have I been pwned.
Compromised data: Email addresses, Passwords
Boxee: In March 2014, the home theatre PC software maker Boxee had their forums compromised in an attack. The attackers obtained the entire vBulletin MySQL database and promptly posted it for download on the Boxee forum itself. The data included 160k users, password histories, private messages and a variety of other data exposed across nearly 200 publicly exposed tables.
Compromised data: Dates of birth, Email addresses, Geographic locations, Historical passwords, Instant messenger identities, IP addresses, Passwords, Private messages, User website URLs, Usernames



easy to copy and fill in login details without having to type anything. They should offer apps for all your devices – including phone and tablet – and robust security, so if there is a breach, your data remains encrypted and out of touch. A good password manager should also provide alerts to data breaches, and offer various tools that can help you target any weak and reused passwords.

We recommend one of three password managers, according to your needs and budget. Have I Been Pwned endorses 1Password, which costs around US$36 a year for a single user or $60 for families, and can be downloaded from **https://1password.com**. It certainly checks all the boxes – we like its Secure Desktop mode, which runs 1Password in an isolated process to keep it out of reach of any keyloggers – but it is expensive.

LastPass (**www.lastpass.com**) has generously made all of its core functionality free, and we love its security audit, which makes it easy to spot and update weak and breached passwords. But its Firefox extension is rubbish, and the data breach it was involved in still rankles, even though user vaults remained encrypted and out of reach.

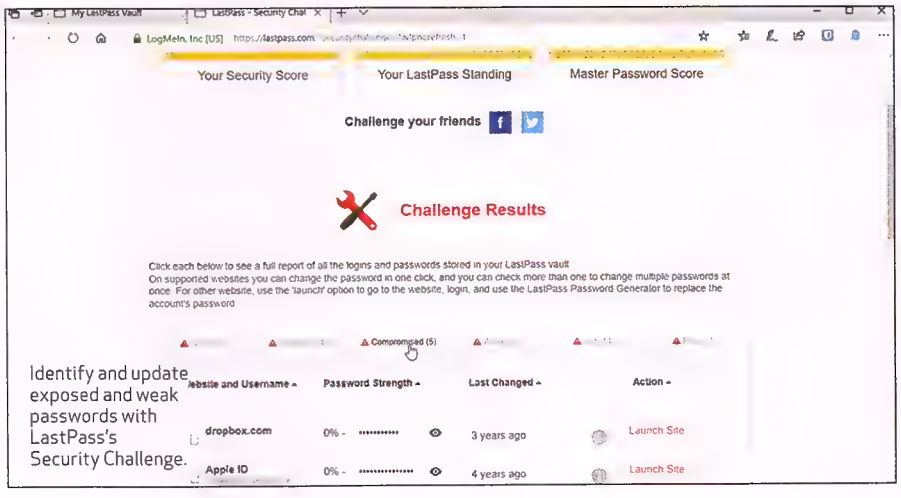
We're personally currently using Bitwarden (**www.bitwarden.com**). It's a little less developed than the other two, but catching up fast. It's open source, most of its functionality is completely free, and its Premium tier is just US$10 a year, which unlocks various reports that can identify weak and compromised accounts.

Whichever manager you opt for, they all work in a similar way. Install the browser extension to access your passwords through your browser. A desktop app is also available, but not strictly necessary. Some features in LastPass and Bitwarden are also restricted to access through your web vault in a browser window.

Create a new account following our advice to set a strong master password. This is also a good moment to consider adding two-factor authentication (2FA) to your password manager.

UPDATE WEAK PASSWORDS

If you've set up a password manager for the first time, you now have to log in to each account individually – when prompted, allow your password manager to save the password in its vault. Next, locate the section where you can update your password – typically under Account or Settings. Use the password manager's random password generator tool to create a new random password – the longer the better. Use a mix of upper and lower-case letters, numbers, and (if allowed) symbols. In short, make it impossible to remember. Copy this to the clipboard, and paste it into the new password fields, before updating your password.


Your Security Score
Your LastPass Standing
Master Password Score
Challenge your friends
Challenge Results
Click each below to see a full report of all the logins and passwords stored in your LastPass vault
On supported websites you can change the password in one click, and you can check more than one to change multiple passwords at once. For other website, use the 'launch' option to go to the website, login, and use the LastPass Password Generator to replace the account's password
Compromised (5)
Website and Username
Password Strength
Last Changed
Action
dropbox.com
0% -
3 years ago
Launch Site
Apple ID
0% -
4 years ago
Launch Site

Identify and update exposed and weak passwords with LastPass's Security Challenge.

If you're lucky, your password manager detects the change and offers to update your password automatically. If not, log out and back in, pasting the new password over the old one in the login box. In most cases, your password manager detects the change and offers to update it; if not, open your password vault, click Edit next to the account, and paste in the new password.

Most password managers record your password history – this will be of use going forward should your password change not be registered, and you're forced to revert to the earlier password to log back in. As you go through your accounts, you'll probably come across some that are effectively dormant or no longer required. Rather than update a password you no longer use, consider deleting the account completely.

If you've been using a password manager for months, most of your logins will have been recorded. Now is the time to use the manager to identify and update weak and compromised passwords. 1Password offers its WatchTower reports in its Windows app, as well as online; LastPass and Bitwarden must log on to their vaults through the web. If you're using LastPass, you should choose Security Challenge on the left – click Show My Score, re-enter your master password, then go through the results. LastPass's Chrome extension even supports updating your passwords in batches to save time. And if you're using Bitwarden Premium, you'll find a selection of reports highlighting problems under Tools.

EMERGENCY ACTIONS

The above is all well and good, but what happens if you get locked out of an account? If you receive such a warning by email, don't rush to click any links in it, as they might redirect you to a facsimile of the genuine website, capturing any details you enter to hack your account. Most browsers and good security suites spot obvious scams a mile off, but check manually anyway.

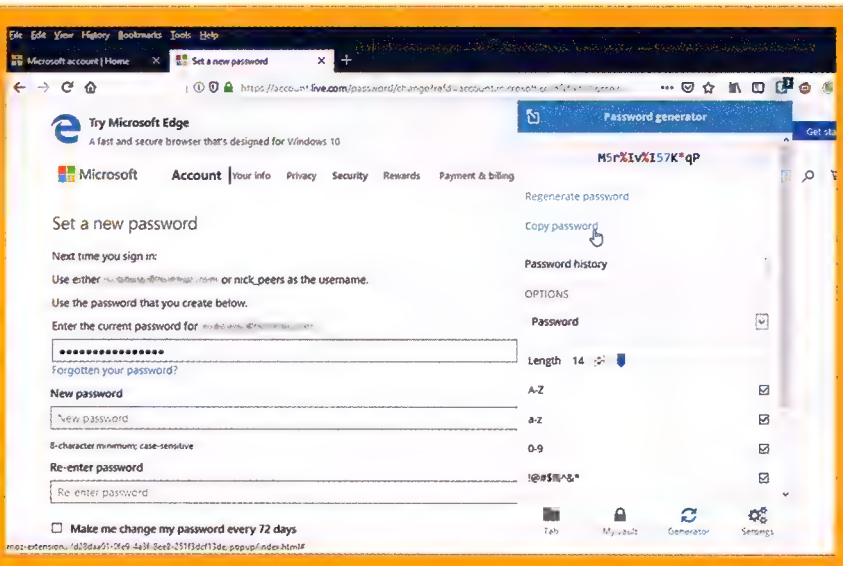
Visit the site in question by typing its address into your browser. Verify the address is genuine by checking the URL in your browser's address bar, and by clicking the lock next to it. If you've been redirected, this indicates your PC's security may have been compromised – read up on previous articles on how to disinfect your PC. If you have access to a second PC you trust and know is clean, use it to secure your accounts before investigating the possible infection on your main PC.

If you're happy the site is genuine, log in, change your password, and look for options to add 2FA. If you find yourself locked out, start by trying a simple password reset – most services offer this. Enter your account email address, and an email will wing its way to that account. If you're happy the request is genuine, this is the one time you do click the link in the email, but double-check you're on the right site. Again, after updating your password, enable 2FA if it's offered.

If you haven't requested a password reset, this might indicate that someone has got access to your email account. All web-based accounts worth their salt support 2FA, so if you have enabled this, you should be fine; otherwise update your password, and activate it.

If you've been locked out of your email account, you're relying on one of two things: that you set up a secondary email you can use as a recovery address to reset your password, or that you can prove who you are using other means. Google, Microsoft, Apple, and other major sites have detailed recovery procedures that enable you to answer certain questions using personally identifiable information. Facebook enables you to nominate a trusted friend to take back control of your account. Again, make sure you're

Check a site is genuine before you log in.



The perfect password

The days of securing your online accounts with short, easily guessable passwords are long gone, but what constitutes the perfect password? Is it using random characters, the password length, or a combination of both? Let's start with characters. Typing nick as your password is clearly weaker than *I3G because nick is easily guessable, particularly if it's your first name.

But guess what? A longer – but memorable – passphrase such as ILoveTheFourthOfJuly is potentially stronger than *I3G because while the passphrase might be guessable, it's more resistant to brute-force attacks, which just run through every possible combination of characters to try to arrive at the correct password. Shorter passwords are therefore easier (and quicker) to crack, as there are far fewer possible combinations.

That said, passphrases are vulnerable as they tend to be reused – if not by you, by others. If a password is exposed because a site's usernames and passwords are compromised, those passwords can be used before employing the brute-force method, rendering the password useless for everyone – not just those who originally used it.

That's why password managers are essential. They enable you to generate long, random passwords that are impossible to remember or guess, and tie up brute-force attacks for months or even years. By that point, the site in question should be aware it's under attack, and take counter-measures.

It's different for your password manager's master password; you must remember that. The trick is to use a system to create a long alphanumeric password (with symbols) that only you can remember. For example, !Eye'Luv#The$4h%OF^July. Pair it with 2FA and a cryptic password reminder (in case you need a subtle prompt), and your passwords will be as secure as they can be.

on the genuine website and not a spoof.

This process also relies on the fact that the hacker hasn't changed your personal information to prevent you from gaining access. You need to consult your email provider's support pages for specific advice if you're unable to get in (search for hacked, recovery, or password reset). Be prepared to make contact by phone if such an option is available.

Once you've regained control of the account, log in to the associated email, and check the inbox, sent, junk, and trash to see if the hacker has left any traces of what they've been up to – including other accounts they've targeted. You may even see spam or infected messages have been sent to your contacts – you'll need to alert them if this is the case.

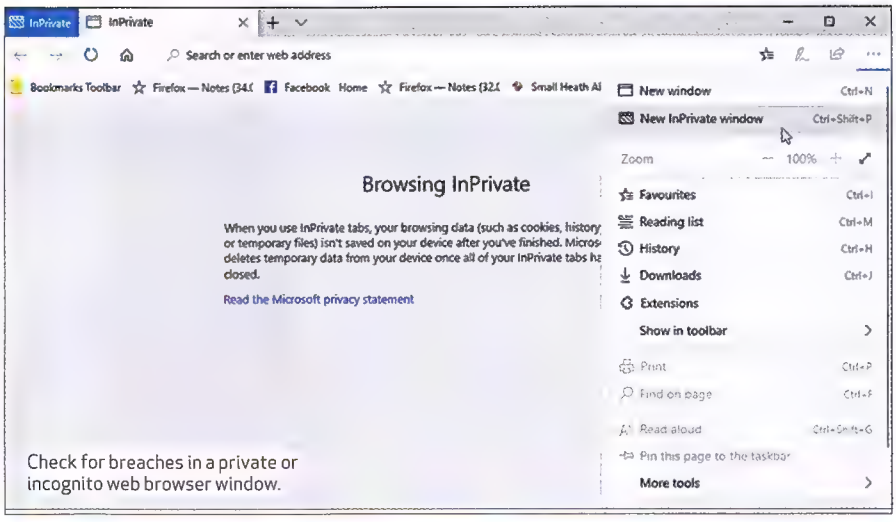
If you think you've been the victim of identity theft – typically revealed by unusual transactions in your financial records—visit one of the credit score providers, such as Equifax (**www.equifax.com**) or Experian (**www.experian.com**), for the steps to follow; usually ordering a copy of your credit reports and filing an initial fraud alert. Contact the police, too, and speak to your credit card provider and bank.

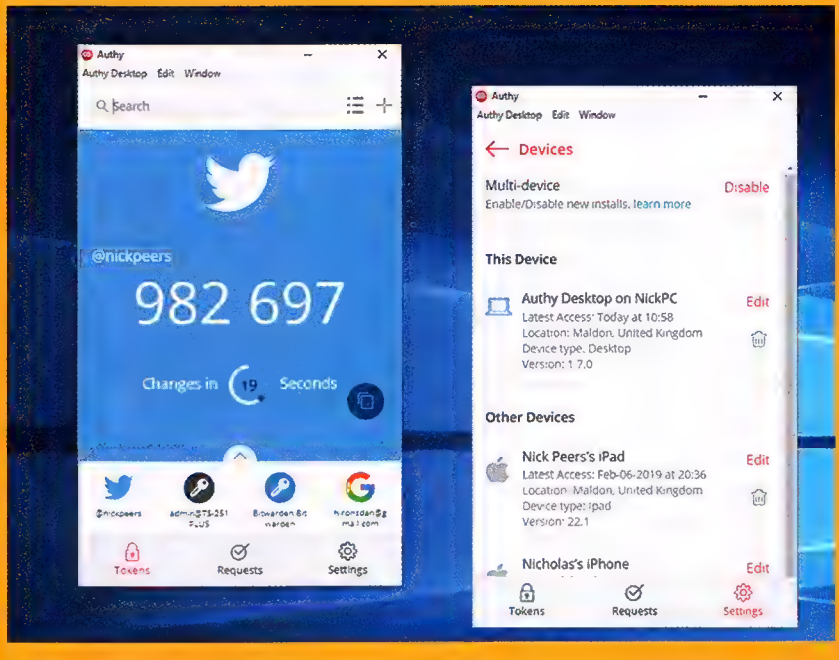
STAY SAFE GOING FORWARD

Once you fixed your problems and ensured your accounts are protected by up-to-date passwords, you're done, right? Not quite. It's time to take a more proactive approach. First, don't worry about changing your passwords every six months as conventional wisdom dictates. Your passwords are no longer easily guessed, and brute-force attacks won't reveal them anytime soon.

That said, it might be wise to change the password at least once a year, particularly on accounts where no 2FA protection is available – reports like Have I Been Pwned are based on old data, so you can't assume you're safe until your password manager alerts you. We also suggest that you update your master password more regularly – every six months, say. Look for an option to rotate your encryption key at the same time.

Otherwise, follow the usual good-practice tips: Enable two-factor authentication (2FA) wherever you can; keep a tight lid on your computer's security, following advice in previous issues; remain vigilant against scammers – most hacks are now instigated through trickery; and above all, don't panic!


InPrivate
Search or enter web address
New window
New InPrivate window
Browsing InPrivate
When you use InPrivate tabs, your browsing data (such as cookies, history, or temporary files) isn't saved on your device after you've finished. Microsoft deletes temporary data from your device once all of your InPrivate tabs have closed.
Read the Microsoft privacy statement
Favourites
Reading list
History
Downloads
Extensions
Show in toolbar
Print
Find on page
Read aloud
Pin this page to the taskbar
More tools
Check for breaches in a private or incognito web browser window.



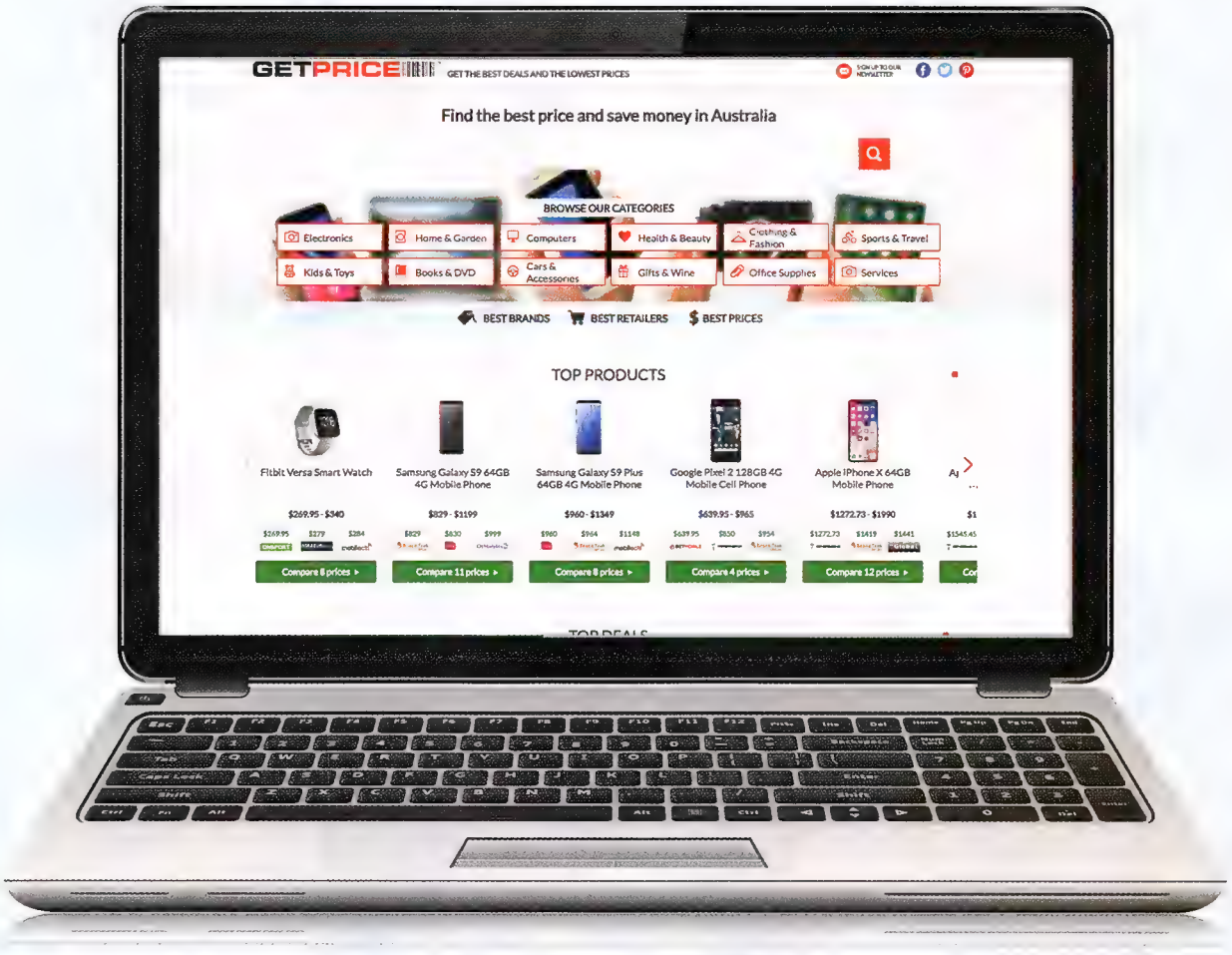
An extra layer of protection

You can practically eliminate the threat from a brute-force attack, but you can't stop passwords being exposed as part of a wider security breach due to mistakes or weaknesses on the part of the online service that is holding your data. So, how do you take steps to protect your account in the event of such an attack?

The answer is 2FA, or two-factor authentication. This introduces a secondary requirement to the log-in process: a six-digit code you need to enter in addition to your password. The code changes regularly, and can be delivered via email, text message, or authenticator app. Email is the least secure – what if your account is compromised? – while authenticator app and text are preferable because they require your phone, a separate device outside the hacker's control.

Text messages require a mobile network – codes tend to change every five to ten minutes – but authenticator apps work offline, and the codes change every 30 seconds, which is obviously more secure. Numerous systems and apps exist, but we recommend Authy (**www.authy.com**), which can be used on more than one device for convenience.

After installing and setting up the app, log in to your online account, and look for a setting to enable 2FA. If it's offered, choose the option to receive codes by app or Google Authenticator if it's name-checked. You can either type in the lengthy code manually, or scan the uniquely generated QR code into Authy using your phone's camera. Enter the six-digit code to verify everything's been set up correctly, and you're done. Just open the app – which can be passcode-protected for additional security in case the phone is stolen – whenever you're prompted to enter a 2FA code to log in.



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YOUR PC REBORN

Give life new life into your Windows PC with our essential guide to fixing, cleaning and tweaking your system for optimum performance.

Perform a health check

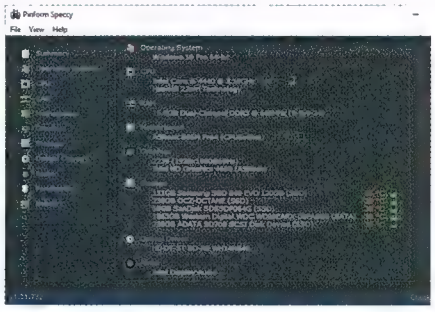
Give your computer a much-needed once over to ensure everything's fighting fit behind the scenes.

If your PC is constantly falling over, or you're suffering performance-related issues with no obvious cause, the best thing to do is give your PC a checkup. Start by performing a physical examination of the underlying hardware. First, perform a power reset: this involves powering down your PC, then unplugging it from the mains and pressing the power button a few times to ensure all lingering power has been discharged (in the case of a laptop, you'll need to disconnect the battery too before pressing the power button).

While your PC is switched off, check that its vents aren't clogged with dust – overheating not only shortens the life of your PC's components, it also affects performance and can be responsible for seemingly random shutdowns. Use a tool like Speccy (**www.piriform.com**) to monitor your PC's temperature sensors. A well-ventilated desktop CPU should run at no more than 50 degrees Celsius in normal use, and no more than 60-65 degrees when it's working hard. Laptop processors run hotter, of course, while hard drives should run cooler.

A VISUAL INSPECTION

If your desktop PC's vents seem clean, consider opening it up to check the fans inside too. Make sure it's switched off at the power socket and that you earth yourself before touching the insides. The first place to check are the fans, specifically the one attached to your processor, plus the one in your power supply and any other case fans there might be. If they're all clean, consider disconnecting the hard drives temporarily and powering up the PC with the case open. Inspect the fans while the PC boots to the BIOS to see if there's any indications of wear and tear – strange noises, for example.



Piriform's Speccy can give you a valuable overview of system temperatures inside your PC.

If the fans check out, power down again and remove the processor fan and heatsink to check the connection with the processor itself. A thin coating of thermal paste should be present – if it has worn away, you'll either have to carefully apply a new coat or consider replacing the heatsink and fan.

Larger fans – if your PC case can accommodate them – run cooler and quieter, but be sure to source the correct fan for your processor make and model – see **www.quietpc.com/cpu-fan-coolers** for more details.

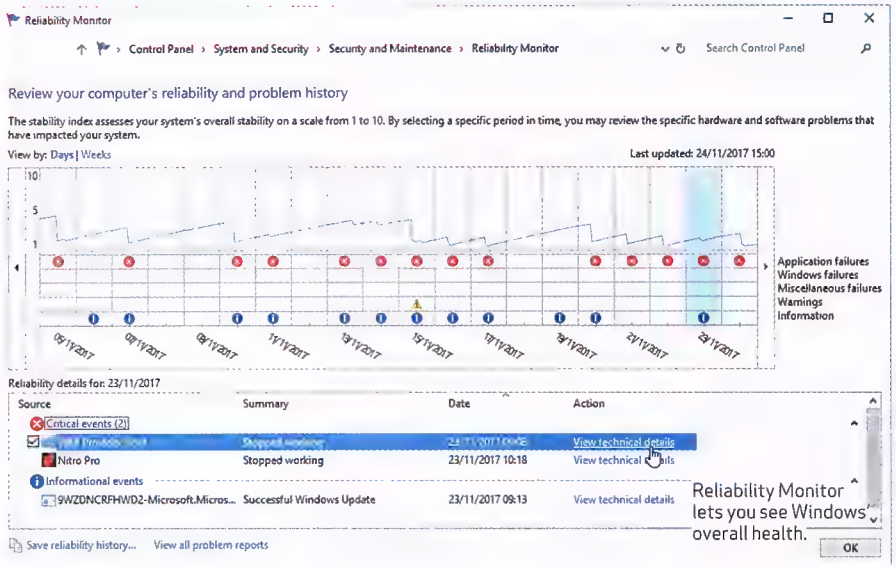
Dodgy power supply fans will require the power supply itself to be replaced. Be sure to pick the same size – the standard ATX measures 86x150x140mm – and at least the same power rating, although look to source a 400W power supply as a bare minimum, or higher if you are able to afford it.

RAM AND HARD DRIVE

Faulty memory and failing hard drives often manifest themselves as random problems rather than consistent ones. Perform a quick check of your RAM by typing memory into the search box and opening the Windows Memory Diagnostic tool. The check is performed outside Windows, so opt whether to run it now or when you next reboot. Any failures point to faulty RAM – if you have more than one stick installed, open up your PC and remove each one in turn to test them separately. Replace like with like using the Crucial Advisor tool (**www.crucial.com/usa/en/advisor**) to identify the correct module for your machine.

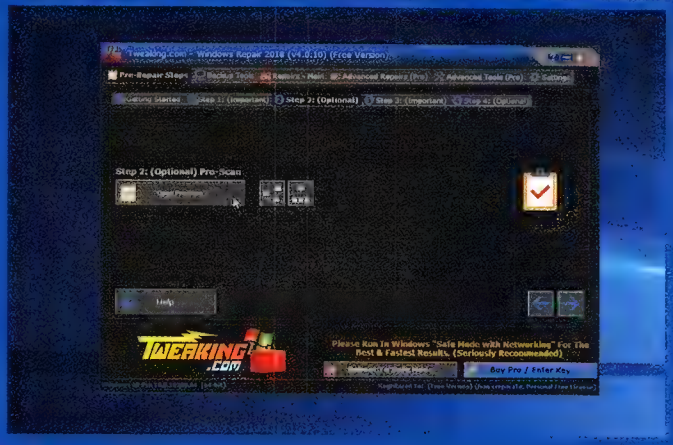
You can also check your hard drives' physical health using the Speccy app via its Storage section. Check each drive's SMART status – anything that's not rated good indicates the drive is on its way out. Replace it as soon as you can, and be sure to back up its contents so your files are safe if the drive goes south.

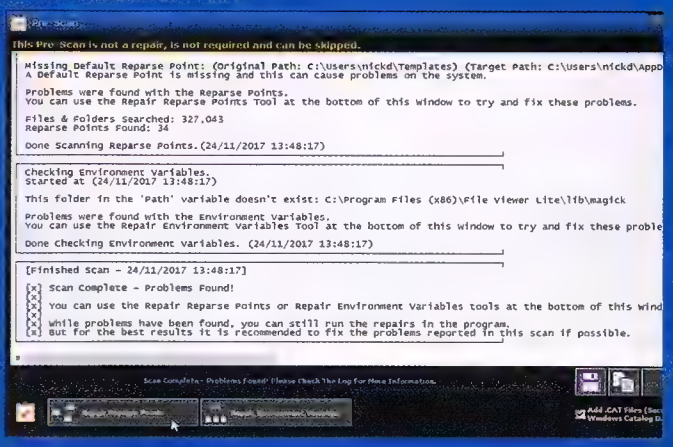
Your Windows installation may also require a bit of TLC. You can get an at-a-glance view of the health of your PC by typing reliability into the search box and clicking View Reliability History. You can see a list of critical errors as well as handy informational events, such as driver or Windows updates. The lower the score, the more help your PC needs. Follow the step-by-step guide on the facing page to get the Windows Repair tool to run some system diagnostics tools, then check its collection of repairs – 47 and counting. If any match specific symptoms that you've been having, they may be the cure to your ills.


Reliability Monitor
Control Panel › System and Security › Security and Maintenance › Reliability Monitor
Search Control Panel
Review your computer's reliability and problem history
The stability index assesses your system's overall stability on a scale from 1 to 10. By selecting a specific period in time, you may review the specific hardware and software problems that have impacted your system.
View by: Days | Weeks
Last updated: 24/11/2017 15:00
Application failures
Windows failures
Miscellaneous failures
Warnings
Information
Reliability details for: 23/11/2017
Source
Summary
Date
Action
Critical events (2)
Nitro Pro
Stopped working
23/11/2017 10:18
View technical details
Informational events
Successful Windows Update
23/11/2017 09:13
View technical details
Save reliability history...
View all problem reports
OK

Reliability Monitor lets you see Windows' overall health.

Give Windows a health check


Step 2: (Optional) Pre-Scan
Help
Please Run In Windows "Safe Mode with Networking" For The Best & Fastest Results. (Seriously Recommended)
Buy Pro / Enter Key

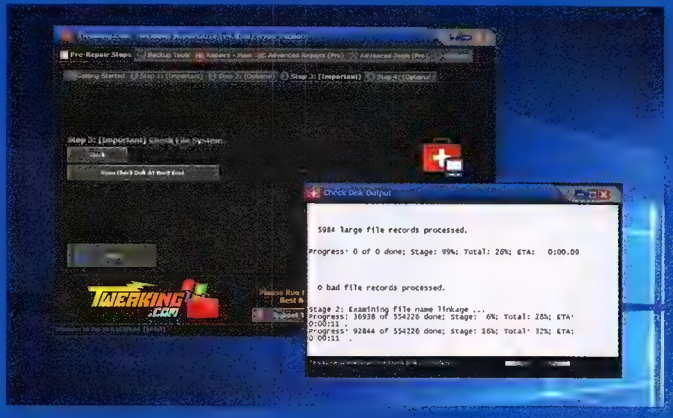

This Pre-Scan is not a repair, is not required and can be skipped.
Missing Default Reparse Point: (Original Path: C:\Users\nickd\Templates) (Target Path: C:\Users\nickd\AppD
A Default Reparse Point is missing and this can cause problems on the system.
Problems were found with the Reparse Points.
You can use the Repair Reparse Points Tool at the bottom of this Window to try and fix these problems.
Files & Folders Searched: 327,043
Reparse Points Found: 34
Done Scanning Reparse Points. (24/11/2017 13:48:17)
Checking Environment Variables.
Started at (24/11/2017 13:48:17)
This folder in the 'Path' variable doesn't exist: C:\Program Files (x86)\File Viewer Lite\lfb\magick
Problems were found with the Environment Variables.
You can use the Repair Environment Variables Tool at the bottom of this Window to try and fix these proble
Done Checking Environment Variables. (24/11/2017 13:48:17)
[Finished Scan - 24/11/2017 13:48:17]
[x] Scan Complete - Problems Found!
[x] You can use the Repair Reparse Points or Repair Environment Variables tools at the bottom of this Wind
[x] While problems have been found, you can still run the repairs in the program.
[x] But for the best results it is recommended to fix the problems reported in this scan if possible.
Scan Complete - Problems Found! Please Check The Log For More Information.

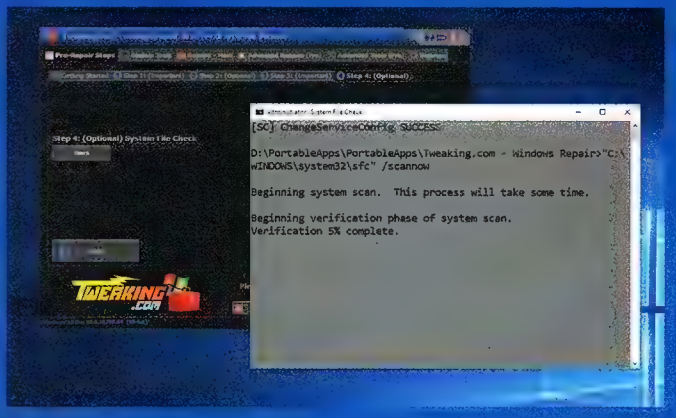
1 SETUP AND REBOOT TO SAFE MODE

Download and install Windows Repair from **www.tweaking.com** – launch the tool, let it perform initial checks and click 'I Agree' when prompted. At the main screen, click 'Reboot to Safe Mode' to restart your PC in Safe mode. Then go to Step 2: (Optional) and click Open Pre-Scan.

2 SCAN FOR ERRORS

The pre-scan scans three specific parts of your system for potential issues – click Start Scan. Reparse or environment errors can be fixed using the repair tools provided; visit **www.catalog.update.microsoft.com** to download and reinstall missing packages (search by KB number).


Check Disk Output
5984 large file records processed.
Progress: 0 of 0 done; Stage: 99%; Total: 20%; ETA: 0:00:09
0 bad file records processed.
Stage 2: Examining file name linkage ...
Progress: 16938 of 554226 done; Stage: 6%; Total: 25%; ETA: 0:00:11
Progress: 92844 of 554226 done; Stage: 16%; Total: 32%; ETA: 0:00:11

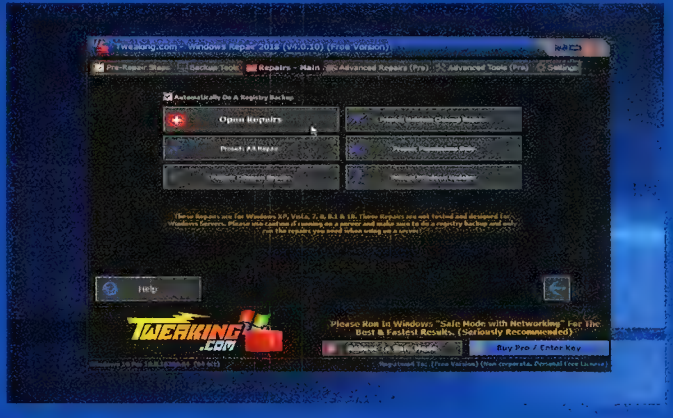

[SC] ChangeServiceConfig2 SUCCESS
D:\PortableApps\PortableApps\Tweaking.com - Windows Repair>"C:\WINDOWS\system32\sfc" /scannow
Beginning system scan. This process will take some time.
Beginning verification phase of system scan.
Verification 5% complete.

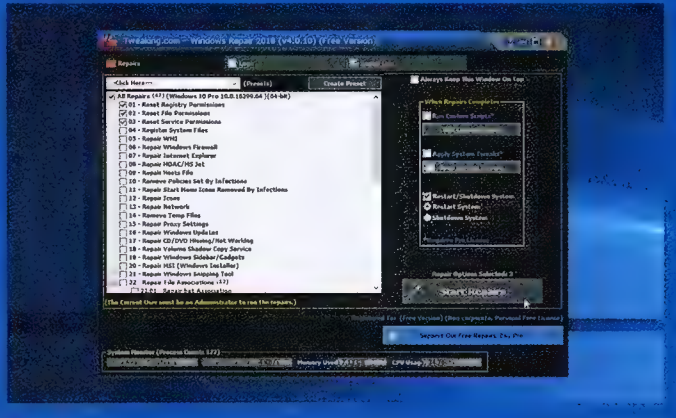
3 CHECK HARD DRIVE FOR ERRORS

Close the window to return to the main Windows Repair screen. Click '>' followed by Check to perform a disk check. If errors are found, click Open Check Disk At Next Boot, then restart your PC to allow Check Disk to find and fix those errors. Once done, return to this screen and click '>' again.

4 RUN SYSTEM FILE CHECK

The final pre-repair step is to run System File Check – this can fix all manner of problems if errors are found, but make sure you've resolved any missing Windows packages first as otherwise it may fail. Once done, click '>' and create both a Registry Backup and a System Restore point using the buttons provided.


Open Repairs
Help
Please Run In Windows "Safe Mode with Networking" For The Best & Fastest Results. (Seriously Recommended)
Buy Pro / Enter Key



5 VIEW REPAIRS

Switch to the Repairs – Main tab. There are some options for trying pre-selected repairs to fix issues with malware, permissions, Windows Update and 'common' problems, but a better bet is to click the Open Repairs button, which will enable you to manually see which repairs are available.

6 SELECT AND FIX

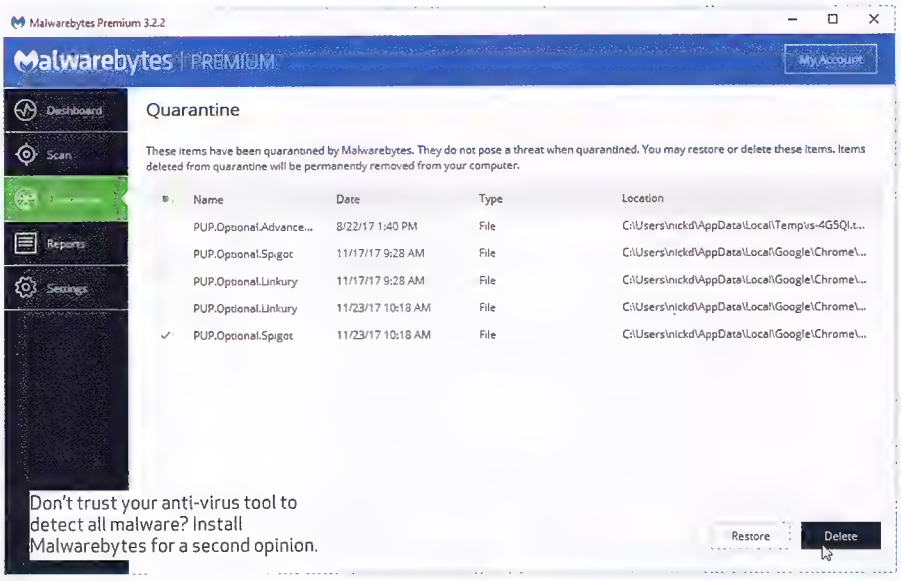
There are 47 repairs in total – switch to the Repair Info tab and use the drop-down menu to select one for more information about it. Select the repairs you wish to attempt, tick Restart/Shutdown System and choose Restart, then click Start Repairs. After rebooting your PC will hopefully be healthier.

Clean up the junk

Take a virtual vacuum to your PC, sucking up unnecessary and unwanted trash to free up system resources.

Why take a feather duster to clean out your PC when our supercharged vacuum cleaning toolkit can do a much better job? Let's start by making sure your PC is malware-free. Open your existing security tool and make sure it's updated, then run a full system scan. If malware is found, let the tool clean it, then reboot and scan again. If the malware's proving tricky to budge, try rebooting your PC in Safe mode and then running your anti-malware tool from there.

Never rely on a single security tool – we recommend that you install Malwarebytes (**www.malwarebytes.com**) alongside your existing security package. It'll often find threats ignored by traditional tools.



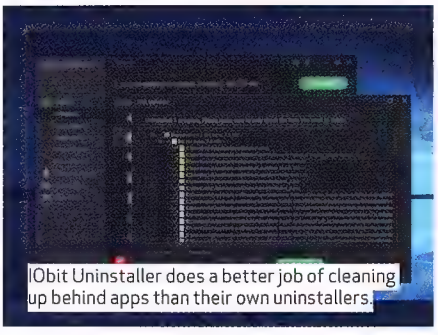
Don't trust your anti-virus tool to detect all malware? Install Malwarebytes for a second opinion.

REMOVE JUNK

You can remove potentially unwanted programs (PUPs) from your PC. Malwarebytes can remove some, but also try the aptly-named PC Decrapifier tool (**www.pcdecrapifier.com**), which will help identify programs you should consider removing.

While PC Decrapifier can remove these unwanted tools for you, relying on a program's own uninstall tool to clean up after itself is – charitably speaking – hit and miss. A more thorough way to get rid of programs is by downloading and installing IOBit Uninstaller Free (**www.iobit.com** – look under Utilities).

Once installed, launch the program. By default, it'll display a list of installed desktop programs. You can click the trash icon next to any one to remove it, or go through the list ticking all those applications you no longer want before clicking Uninstall to remove them in sequence. You'll be

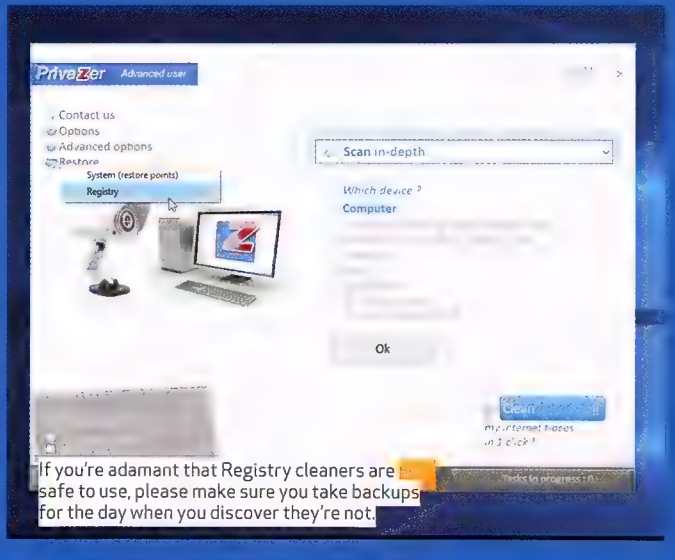

IObit Uninstaller does a better job of cleaning up behind apps than their own uninstallers.

Avoid Registry cleaning

You'll notice we recommend de-selecting PrivaZer's Registry cleaning component – and for good reason. Cleaning Registry entries has zero effect on your computer's performance, but one false misstep and you can cause major problems that could ultimately bring your PC's installation crashing down. Don't believe us? Support Squad is littered with emails from people who've relied on Registry cleaning tools only to find that their systems have been crippled as a result.

The only exception to this rule is when you use IOBit Uninstaller to remove programs from your PC. It's specifically looking for entries related to the program you're uninstalling, which means you can make a measured judgement about whether they're safe to remove or not.

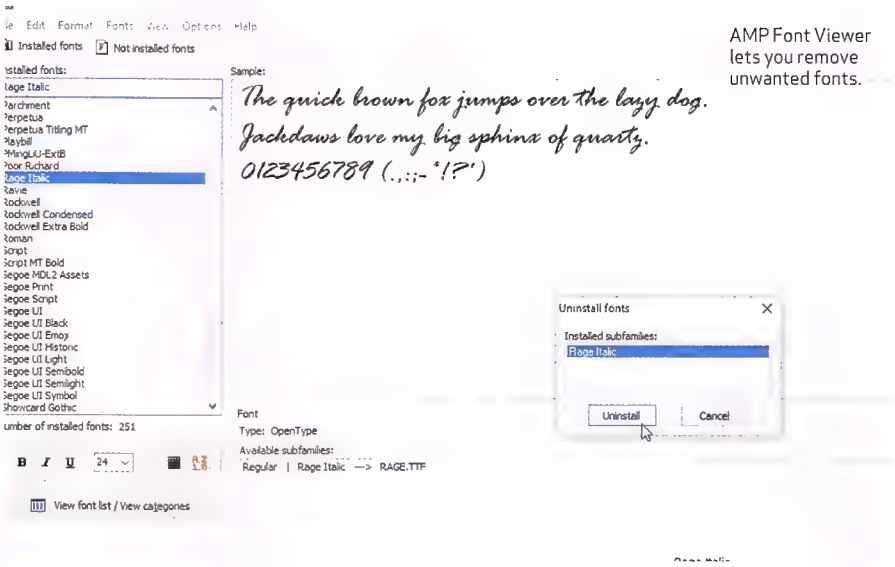
If you're not convinced, then at least take a System Restore point before you clean out the Registry. Also make sure 'Save registry' is ticked on PrivaZer's scanning window before clicking Clean. If you run into problems, click the Restore button on the main screen and select Registry. Restore the latest backup to see if that fixes the problem; if not, try using earlier backups until the critical entry is hopefully restored.



If you're adamant that Registry cleaners are safe to use, please make sure you take backups for the day when you discover they're not.

asked if you want to automatically remove residual files (and Registry entries) – untick this if you'd like to review what's removed first. Setting a System Restore point is not usually necessary, unless you are removing lots of programs at once.

Each program is removed in the same way: first its own uninstaller removes the program, then leftovers are either cleaned automatically or you can review what's being deleted before choosing what – if any – of it to remove. Once done, move on to the Windows Apps section to clear out Microsoft Store apps, including those pre-installed with Windows itself (these can always be reinstalled later through the Store). Finally, use the Toolbars & Plug-ins tab to review and remove unwanted browser toolbars from all your browsers.



AMP Font Viewer lets you remove unwanted fonts.

DIG DEEPER

Want to clean out other parts of your PC? Put off by the recent malware scare surrounding CCleaner? One alternative is PrivaZer – go to **www.privazer.com** to download and run the portable version. Start by setting the program's scope: tweak Adapt PrivaZer to your needs, then click Next. Choose 'Advanced' to work through all 14 possible options. Each one is self-explanatory and basically tells PrivaZer how far you want to go with your cleaning – everything from cleaning out various software configuration files (such as Office or photo apps).

In most cases, the recommended options are best left alone – the only question mark lies with disabling hibernation on Windows 10 PCs, which may cause problems if you suffer a power cut during shutdown.

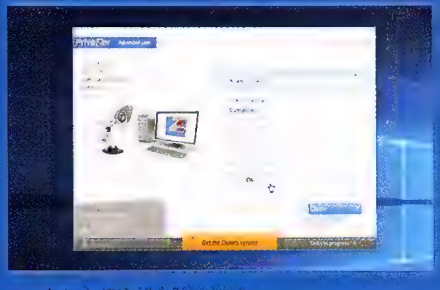
Once your preferences have been selected, choose the new file option and click OK. You'll then be taken to the main menu – the step-by-step guide (below) reveals where to go from here. If in doubt, don't delete anything. PrivaZer will securely overwrite any data it removes, so recovery will be impossible.

NICHE CLEANING

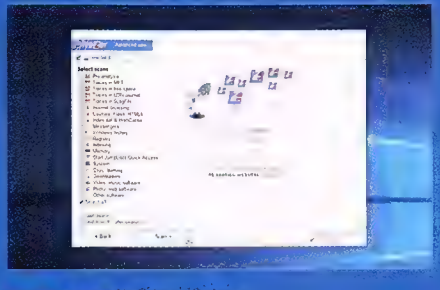
Want to go even further? If you're regularly cursing at the number of fonts offered by your office software, why not take steps to remove those unused typefaces? You'll not only benefit from a more manageable fonts menu, you'll free some additional system resources too. The best way to manage your font collection is using AMP Font Viewer (**www.ampsoft.net/utilities/FontViewer.php**). Download and extract the portable version (ZIP file), then right-click FontViewer.exe and choose 'Run as administrator'.

Go through the list identifying fonts you don't use – right-click these and choose 'Uninstall font', which removes it completely. Fonts are moved to your Documents folder as a backup – choose Options › Options to choose a more convenient location. Should you ever want to restore a font, switch to the 'Not installed fonts' tab, navigate to your backup folder and choose either 'Install selected font' to put it back permanently, or 'Install font temporarily', which enables you to use the font until you restart Windows.

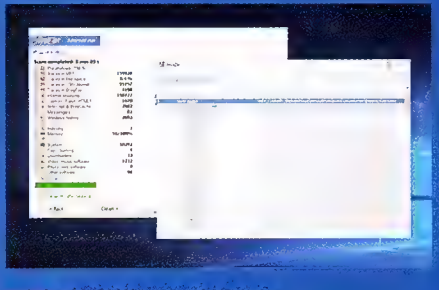
Clean your storage drive



1 CHOOSE OPTIONS
Click 'Advanced options' under PrivaZer's main menu, tick 'Save registry changes made by next cleanups', then click OK. By default, your entire computer is selected for scanning. You can choose a different option under 'Which device' to restrict it, if you wish. Leave 'Scan in-depth' selected and click OK.



2 SCAN FOR ITEMS
By default, all the scans you have previously chosen are selected, along with your C drive – you will need to repeat for any other drives that you wish to check. Roll your cursor over one of PrivaZer's options to learn more about it, then untick any that you want to exclude before clicking the Scan button.



3 REVIEW AND CLEAN
Once PrivaZer has completed its scan, click on an item to select it, then click the results to see what's been found. Untick any categories that you don't want to remove, such as jump lists and Registry entries, before clicking Clean to remove all the detritus that you're happy for the utility to delete. Good luck!

Consolidate your files

Take your cleaning one step further by reorganising and consolidating your data files to free up storage space.

Over time, your machine's drive becomes cluttered up with data files of all shapes, sizes and types. Compounding things are the way in which duplicates can quickly swallow up more storage space thanks to disorganised backups or the fact you have five near-identical copies for every snap you take on your phone or digital camera. The longer this process goes on, the harder it can be to face up to the problem, but today's the day you finally take steps to not only consolidate your files properly, but free up space too.

Use a tool like Simplenote to provide a list of your drives.

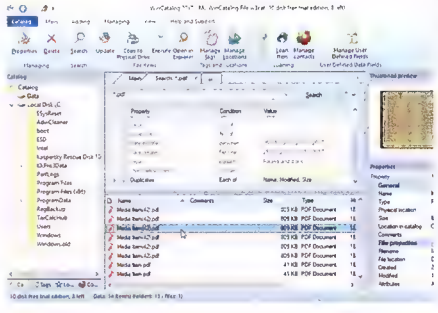
FIRST STEPS

For this process to work, you need to work out where you are going to store everything. You also need to remember that moving files to a secondary drive isn't the same as backing them up if they remain the only copy in existence, so be sure to keep two copies of key files on separate drives.

Start by taking an inventory of all the available drives: your PC's internal drive or drives, plus any external (USB or network) drives that you possess. First, determine how you'd like to organise them going forward. Use a spreadsheet or note-taking tool to help you visualise what you'd like to do.

If you want to take an inventory of each drive's contents for manually comparing it, then save yourself a huge task by installing the trial version of WinCatalog 2018 (**www.wincatalog.com/free.html**). There's a fully featured 30-day trial so you can see whether the app suits your needs – a personal licence costs US$29.95.

Once installed, launch the program and create a catalogue file when prompted. Then click the Disk button to select your first drive. Click 'Options' to choose exactly what to add to the catalogue – you may wish to restrict it to covering specific content, or even just provide a list of folders, which will speed up the scanning process considerably, although you'll be limited in what you can do with the program.



WinCatalog's search tool enables you to find and identify duplicates quickly.

Once your drives have been indexed – which can take a while – you can then start to see how data is currently spread across your drives, making it easy to visualise where you'd like your files to go. If you index everything on your drives, you can even use WinCatalog's Search tool to try and track down files you've mislaid – perhaps they weren't accidentally deleted after all, merely buried deep inside your file system.

GET RID OF DUPLICATES

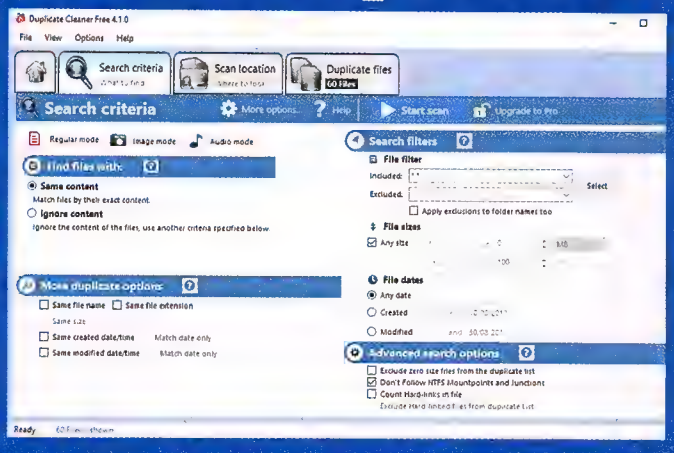
One of the most important actions when consolidating your files is to weed out duplicates. Not only will you free up stacks of space, you'll avoid wondering what happened to your recent edits because you've opened the wrong copy of a file. WinCatalog's search tool can locate duplicates by filename, size and date modified – expand the Property pane to locate it, then click the ellipsis (...) to select other criteria to match, such as the CRC32 checksum.

The search tool is lightning fast – results are returned instantly, but remember you are only working within its catalogue, not the physical files themselves. If you want to remove duplicates, you'll have to right-click each duplicate in turn and choose 'Open in Explorer' to manually delete it yourself.

Too much hassle? This is where Duplicate Cleaner Free comes in, and the step-by-step guide on the page opposite reveals how to use it to weed out and remove exact duplicates. If your storage drive is stuffed full of similar files – such as multiple photos that are almost identical from your phone or camera – then upgrade to the Pro version for $7.95, or try AntiDupl (**https://sourceforge.net/projects/antidupl**) instead, which can be configured to match similar as well as identical files.

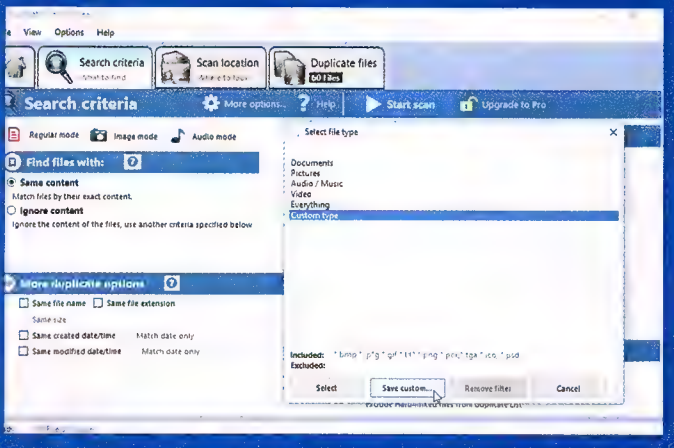
Once you have removed unnecessary files, you can then look to consolidate all the ones that remain in a way that will enable you to easily find them going forward. If possible, store these on a separate partition or drive to your Windows installation, so the next time you reinstall you don't have to worry about backing up and restoring your data first – although you should still make sure you regularly back up these files to yet another drive for safe-keeping – just in case you have a problem with your PC down the road.

Remove duplicate files quickly



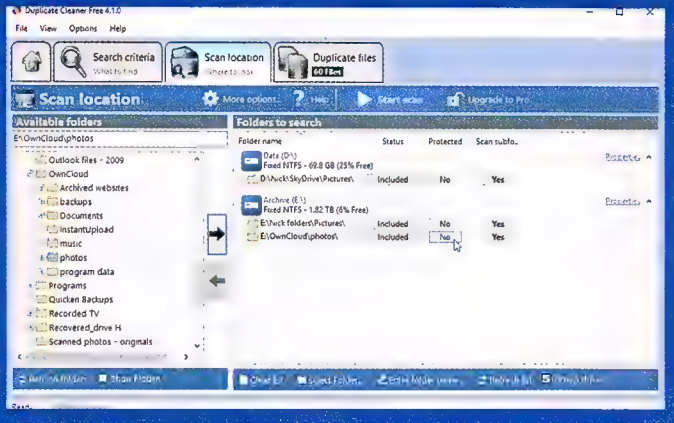
1 CHOOSE YOUR CRITERIA

Download Duplicate Cleaner Free (**tinyurl.com/APC469PC3**), then install and launch the program. By default, the most accurate type of search – a file's content – is selected, but you can choose to search by different criteria – file name, size and so on – if you prefer.



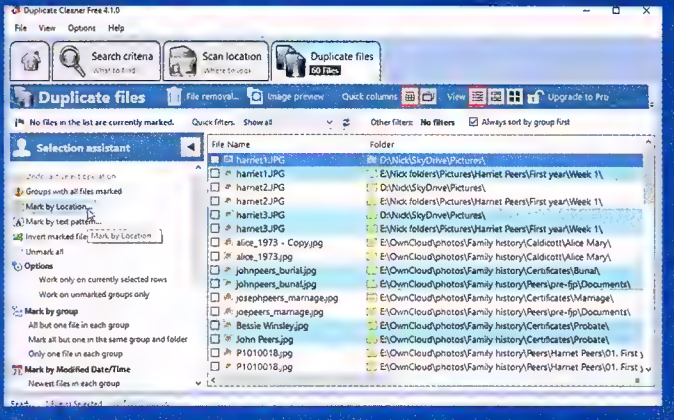
2 CHOOSE A FILE FILTER

Click 'Select' to quickly set a search filter for specific files by type. These limits aren't comprehensive, so add your own file types to the end of the Included list (*.docx and *.rtf for text files, for example), separating each with a semi-colon. You can set file size and date limits, too, if you wish.



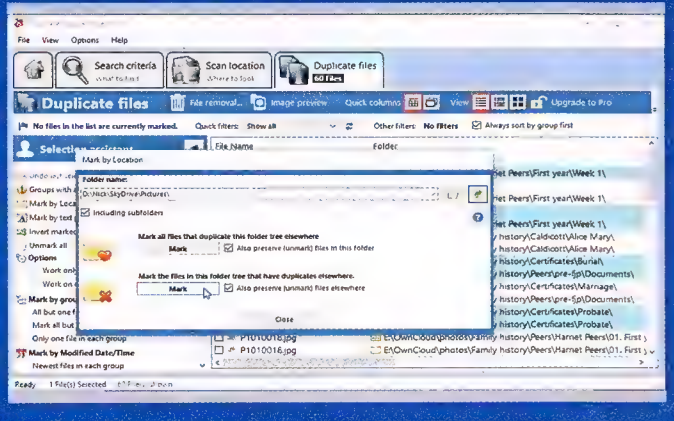
3 SELECT SCAN FOLDERS

Switch to the Scan Location tab to select one or more drives or folders to search. Select one in the left-hand pane, then click '>' to move it to the right. Decide if you're searching for sub-folders or not – click Protected if you want to make it impossible to delete files from a specific folder.



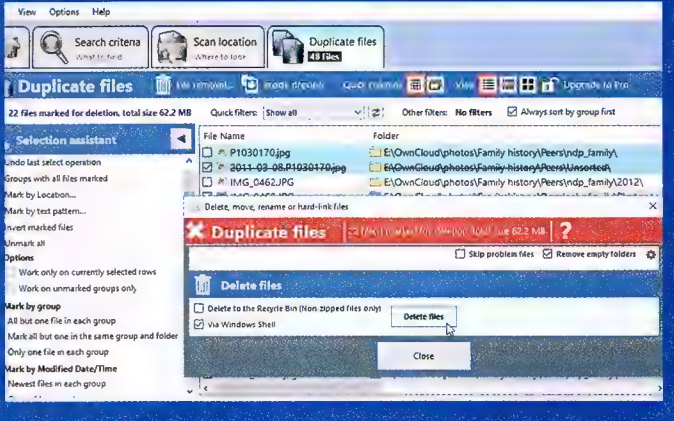
4 REVIEW AND SELECT

Click 'Start Scan' and wait while the folders are searched. A list of matching files – conveniently colour-coded to help you determine duplicate pairs – will be displayed. To clear everything from a specific location, select one of the files from that location and choose 'Mark by Location…'



5 SET UNWANTED FOLDER

Click the right-hand button next to the 'Folder name:' box to select your path. Now click the bottom-most Mark button to mark all the duplicate files in this folder for deletion and click Close. You'll see those files are now marked for deletion. You can also manually select/deselect files using the tick boxes.



6 REVIEW AND DELETE

Use the 'Image preview' button to compare two photos side-by-side if you need more clarification. You can also use the View buttons to choose a different way of comparing files – handy for checking photo thumbnails quickly. Once you're happy, click 'File removal…'. Review the warning and click 'Delete files'.

Streamline your PC

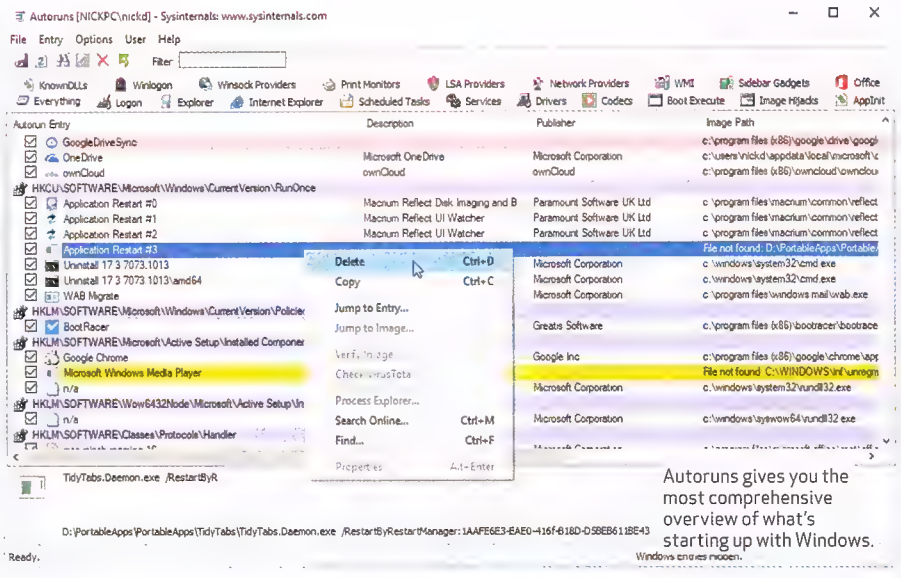
Find out how to get Windows back into something like the shape it was in when you performed your last reinstall.

Beneath the surface of Windows lies a seething mass of programs, services and other system files all competing for a share of finite resources. It doesn't matter how many cores your processor has, how much RAM you stuff into your PC or whether you switch to an uber-fast solid-state drive (SSD), your PC finds a way of gobbling up everything you throw at it. In this section, we're going to show you how to rein it in.

TAME STARTUP

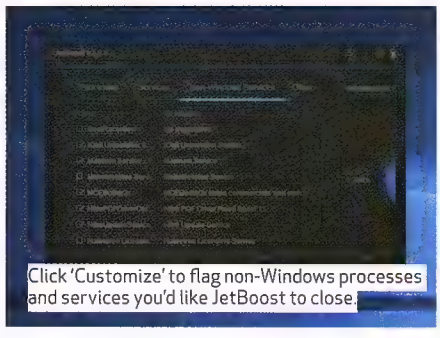
The problems begin the moment Windows appears to have finished loading. If your computer had a stomach it would be doubled over with indigestion the way start-up programs and services start demanding attention even before you have managed to log into your user account.

BootRacer (**www.greatis.com/bootracer**) is a great tool for monitoring and improving the boot times of your PC. It also includes Startup Control, a handy tool which delays start-up items until Windows has finished loading itself, then lets you see exactly how long each item takes to load. Not only can you disable and delete start-up items, you can swap their running order around too – click Set Order on the main Startup Control window and use the arrow keys to either side of a boot entry to move it up and down the list.



Autoruns gives you the most comprehensive overview of what's starting up with Windows.

If you want even more control over startup, including viewing hidden parts of the start-up process, download Autoruns from **https://docs.microsoft.com/en-us/sysinternals/** – look under Process Utilities. Unzip its contents and run Autoruns.exe (32-bit) or Autoruns64.exe (64-bit) by right-clicking it and choosing 'Run as



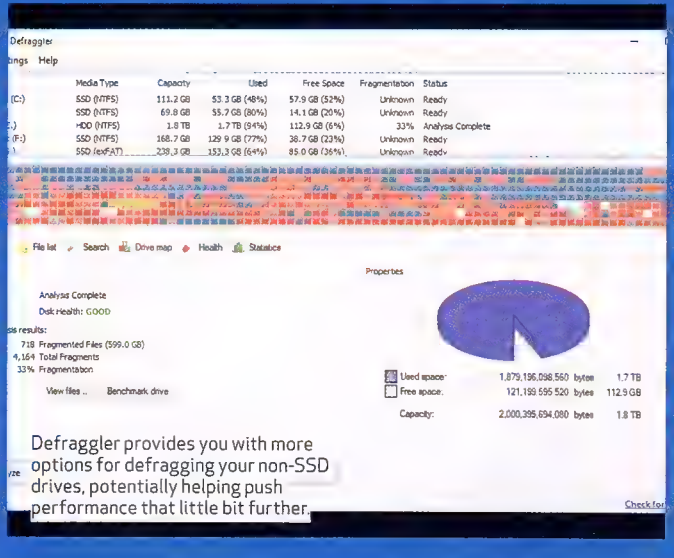
Click 'Customize' to flag non-Windows processes and services you'd like JetBoost to close.

Improve hardware performance

Looking for ways to tweak your PC hardware? Start by making sure you have the latest drivers for key components, such as your graphics card. If you've been relying on Windows Update to deliver these, try visiting the manufacturer's site directly to see if a newer driver is available. Alternatively, try a driver-sourcing tool such as IObit's Driver Booster (**www.iobit.com** – look under Performance), which can do all the grunt work for you.

One of the biggest bottlenecks in your PC is its hard drive. Type **defrag** into the Search box and open the 'Defragment and Optimise Drives' tool. This will enable you to see if your SSD drives are optimised and your non-SSD drives defragged. Ultimately, if you have an SSD drive, there's little you can do to improve performance, and most optimisations have a negligible effect.

Non-SSD users might want to try Defraggler (**www.piriform.com/defraggler**) instead of the default Windows utility. Advantages include being able to defrag individual files and folders on demand, plus the tool can defrag system files and move larger files to the end of the drive to help boost performance further.


Defraggler
Media Type Capacity Used Free Space Fragmentation Status
File list Search Drive map Health Statistics
Properties
Analysis Complete
Disk Health: GOOD
Used space: 1,879,196,096,560 bytes 1.7 TB
Free space: 121,199,595,520 bytes 112.9 GB
Capacity: 2,000,395,694,080 bytes 1.8 TB

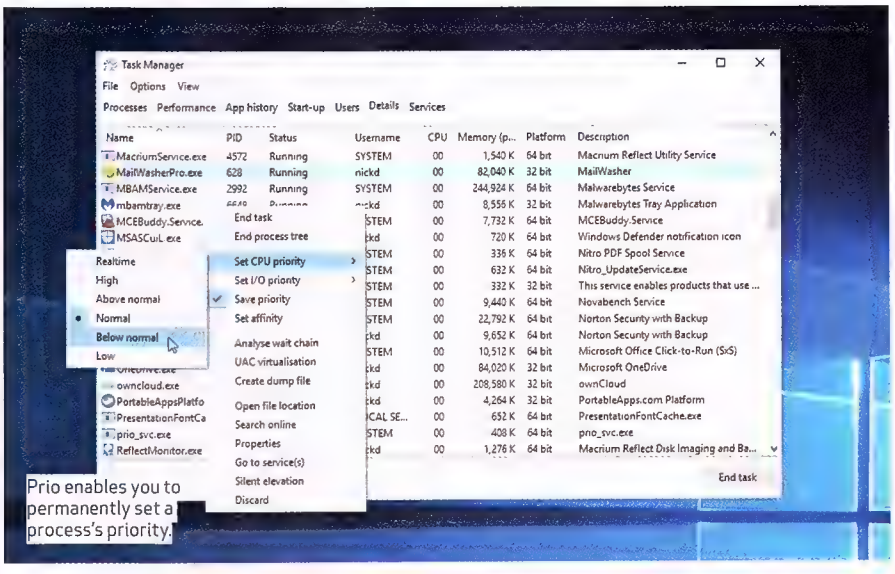
Defraggler provides you with more options for defragging your non-SSD drives, potentially helping push performance that little bit further.

administrator'. You'll see a bewildering number of tabs appear – the Logon tab closely resembles what's shown by BootRacer, but it also includes additional entries. Some tabs are – thankfully – empty but focus your eye on Scheduled Tasks as well as Explorer. Look for items marked in red or yellow – try disabling these first by unticking them; later you can right-click them to delete them, and perform other tasks such as choosing Check VirusTotal to upload the file in question for a malware scan online.

BRING SERVICES INTO LINE

You'll notice a Services tab in Autoruns, which mirrors what's shown when you press Win-R and type services.msc into the Run box. These system programs run in the background and while most are linked to Windows, not all are. Not all are necessary and if you want a quick and dirty speed boost, installing Easy Service Optimizer (**www.sordum.org/?p=8637**) will enable you to choose one of four presets depending on what services you're willing to sacrifice in the name of performance. If you want to temporarily suspend non-essential services when performing resource-heavy tasks, such as playing games or ripping high definition (HD) video, then try JetBoost (**www.bluesprig.com/jetboost.html**).

Services compete for resources like everything else, but did you know it's possible to allocate different priorities to services and programs to give favoured apps more access to those precious resources? You can do this via Task Manager (right-click the Taskbar to open it) – switch to More Details view. Locate your target app under Processes, right-click it and choose 'Go to Details'. Right-click the highlighted process and choose Set Priority to see your options.



Whatever you do, avoid 'Realtime' – this will quickly bring Windows grinding ,to a halt. Instead nudge processes up or down a single notch to 'AboveNormal' or 'BelowNormal' respectively. Setting certain background processes to BelowNormal can hand resources to other programs without unduly affecting their own performance.

MANAGE PROCESSES

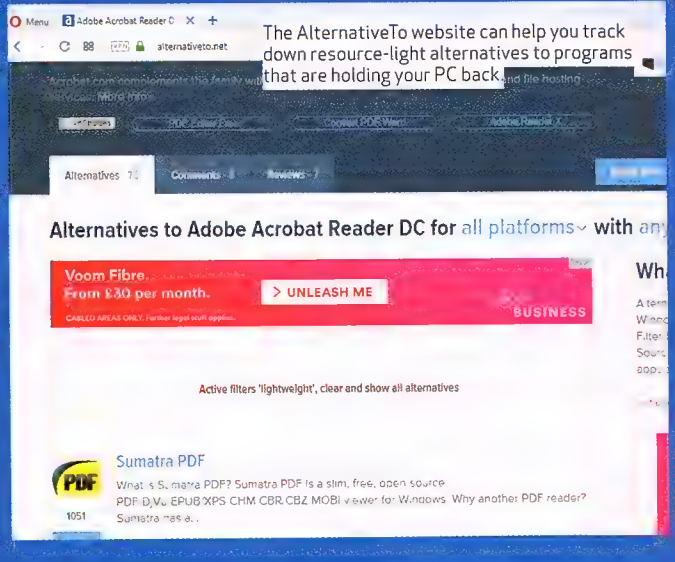
The major problem with Task Manager is that your custom priority setting lasts only as long as the process is running. The next time it's launched, priorities are reset to Normal. If you'd like to permanently raise or lower a process, you'll need a program called Prio (**www.prnwatch.com/prio/**). Download the 32-bit or 64-bit version as required, and once it's running, you'll find a new Save Priority option has been added to the Set Priority sub-menu. Make sure it's ticked and any changes you make to a process's priority will be stored and reapplied the next time it's run.

If you're running a low-powered PC that often appears to hang for periods of time, then take a look at Process Lasso (**https://bitsum.com**) – the free version can 'balance' the demands made by processes, automatically lowering the priority of any which threaten to overwhelm your PC's limited resources. Once installed, you can leave the program to its devices.

Banish sluggish programs

Most of your computing life is spent using applications rather than Windows itself. If your PC is struggling under the weight of all the programs you use on it, consider trying to source more lightweight alternatives. First, see if you can source a portable version of your favourite program using **www.portableapps.com** as a starting point as well as the app's own website. Portable versions are self-contained, so only consume resources when they run and don't clog up the Registry or other system folders. An added benefit is they can be stored on another drive to Windows, ensuring that they – and your precious settings – survive your next reinstall or major system crash.

Second, see if a faster, less bloated alternative is available for those programs you can easily swap out – programs worth swapping include your office application, PDF reader, image editor and even your security software. Visit **https://alternativeto.net** to see which alternatives are out there for a specific program – use the 'lightweight' filter to narrow down your search to lessdemanding alternatives.


The AlternativeTo website can help you track down resource-light alternatives to programs that are holding your PC back.
Alternatives to Adobe Acrobat Reader DC for all platforms with
Voom Fibre.
From £30 per month.
UNLEASH ME
BUSINESS
Active filters 'lightweight', clear and show all alternatives
Sumatra PDF

MOVE ON FROM WINDOWS 7

The time has come to upgrade that old operating system. By Alex Cox.

Although the world might like to argue – statistics show that Windows 10 has only just, in the last few months, beaten Windows 7 in worldwide usage rankings – Microsoft has made its decision. The hammer will come down on Windows 7 in early 2020, and unless you're part of a business willing to pony up a whole load of cash, all support for it will be dropped. That means no updates, no security patches, nothing. It'll be put out to pasture, to live out the rest of its days on a beautiful farm, increasingly infested by worms and open wounds.

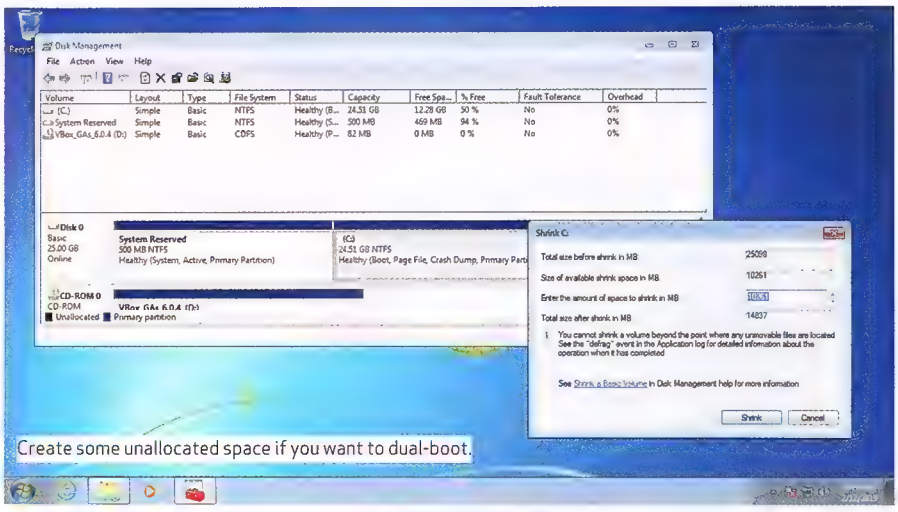
In truth, you might not be overly worried about this. No more Windows Updates sounds like bliss to some people. Indeed, Microsoft ceased all major updates for Windows 7 way back in 2015; a reduced tendency to shut down at a moment's notice in order to grind away at your hard drive is, realistically, one of Windows 7's big selling points in this day and age. But you should be worried. While you might prefer Windows 7's more simple, streamlined interface over the ever-changing landscape of Windows 10, it's almost a decade old. Soon it won't only be Microsoft abandoning support – it'll be everyone. Valve, for example, recently ditched Windows XP and Vista support for Steam, and while Windows 7 represents a big chunk of its market, it won't forever.

Whisper it, but moving to Windows 10 makes a huge amount of sense. Microsoft intends, at least right now, for Windows 10 to be its last operating system. It won't be abandoned or outdated – rolling feature updates mean major new versions make their way to your desktop twice a year. The longer it stays around, the better it'll become (at least in theory), and even if you're a committed Windows 7 user running older hardware, you'll probably be surprised at how slick and speedy it truly is. The time has come to move on – but even if you're steadfastly staying put, or going elsewhere, there's a lot you need to know.

WHERE WE ARE

So, what's happening? On January 14, 2020, Windows 7 will reach End of Life status. No new patches or updates will be released, and most likely all help and support for Windows 7 will also disappear. You won't suddenly wake up to find your Windows 7 machine blue-screened and dead. More likely, you'll get a notification that support has ended (perhaps with a final plea to upgrade to Windows 10), and be allowed to go on with your day. That's the good news. The bad news is that, as of January 15, Windows 7 becomes a huge target for hackers. Any vulnerabilities left unfixed will stay unfixed. Viruses and malware targeting these holes will undoubtedly be rife, particularly given Windows 7's huge user base, to date far larger than the 29 percent held by Windows XP when it hit End of Life in April 2014.

You have a number of choices, which we'll break down. You can grit your teeth (or perhaps open your wallet) and continue to use Windows 7. You can make the leap to Windows 10, which is surprisingly friendly to older hardware. You can, if you're really lagging behind, grab some new hardware. Or, if you're feeling cavalier, you could use this as your incentive to move to Linux. We're not telling you what choice to make, but it pays to know what you're getting into before you nail it down.


Disk Management
File Action View Help
Volume Layout Type File System Status Capacity Free Spa... % Free Fault Tolerance Overhead
(C:) Simple Basic NTFS Healthy (B... 24.31 GB 12.28 GB 50 % No 0%
System Reserved Simple Basic NTFS Healthy (S... 500 MB 469 MB 94 % No 0%
VBox_GAs_6.0.4 (D:) Simple Basic CDFS Healthy (P... 82 MB 0 MB 0 % No 0%
Disk 0
Basic
25.00 GB
Online
System Reserved
500 MB NTFS
Healthy (System, Active, Primary Partition)
(C:)
24.51 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)
CD-ROM 0
CD-ROM
Unallocated
Primary partition
Shrink C:
Total size before shrink in MB 25088
Size of available shrink space in MB 10251
Enter the amount of space to shrink in MB 10000
Total size after shrink in MB 14837
You cannot shrink a volume beyond the point where any unmovable files are located. See the "defrag" event in the Application log for detailed information about the operation when it has completed.
See Shrink a Basic Volume in Disk Management help for more information
Shrink
Cancel
Create some unallocated space if you want to dual-boot.

STICKING WITH 7

As we said, Windows 7 isn't going to self-destruct when it reaches End of Life. And, weirdly, despite its imminent death, Microsoft isn't going to actually stop supporting it, at least if you're running a business-grade edition. Extended security updates will be available for at least the three years that follow End of Life, on a sliding price scale. Windows 7 Enterprise Edition users will be charged US$25 (around AUD$35) per machine in year one, US$50 (around AUD$70) in year two, and a cool US$100 (around AUD$142) for the year ending January 2023. Windows 7 Pro edition prices are twice that, meaning you'll end up spending as much as a full-price Windows 10 license by the end of the second year. That's quite the incentive.

Realistically, it's possible you don't absolutely need any future security updates. If you're running a fairly static machine – a Windows 7 PC acting as a server, for instance, or a single-purpose media box that's not necessarily going to rely on future software support – it's entirely possible that you won't be installing anything new or performing too many online actions. In these cases, if you're incredibly careful, cagey, and can handle the anxiety, it should be feasible to carry on as you were, as long as you keep in mind that malware that exploits network vulnerabilities may still snake its way into that box from another source.

We certainly foresee many businesses sticking with Windows 7 and not paying the Microsoft tax; we've witnessed enterprising 'if ain't broke' individuals running DOS-based interfaces, and even, once, a Commodore 64, so it's not unheard of. But again, it's not sensible, and if you do decide to take this tack, make sure everything you care about is backed up safely away from that Windows 7 box. There will also be people who don't want to give up a well-honed and tuned Windows 7 install. In this case, it's entirely possible to dual-boot Windows 10 and Windows 7, though that's basically the epitome of operating system pettiness. On Windows 7, shrink your main drive using the Disk Management tool (or hook up a second internal drive, if you're able to), then when installing Windows 10, choose a custom install, and drop it in that now-unallocated storage space.

Linux Mint is easy to get started with, and close to that cosy Windows layout.

ALL THE WAY TO 10

At this point, you have missed the boat on (officially) moving up to Windows 10 cost-free. Microsoft's GWX tool, the over-forward pop-up that encouraged Windows 7 users to upgrade for the princely sum of $0.00, disappeared on schedule in mid-2016. That makes sense; when Windows 10 first launched, Microsoft was eager to fudge the numbers, offering to upgrade your Windows 7 (or Windows 8, or 8.1) license to Windows 10 for free. After that, it was time to sell some licenses – Windows 10 Home will set you back $225, while the Pro version costs $339. But that's not necessarily the end of the story. It's possible to get a much cheaper key (see the 'Bag a bargain' box on the page

opposite), and you may not even need to pay at all.

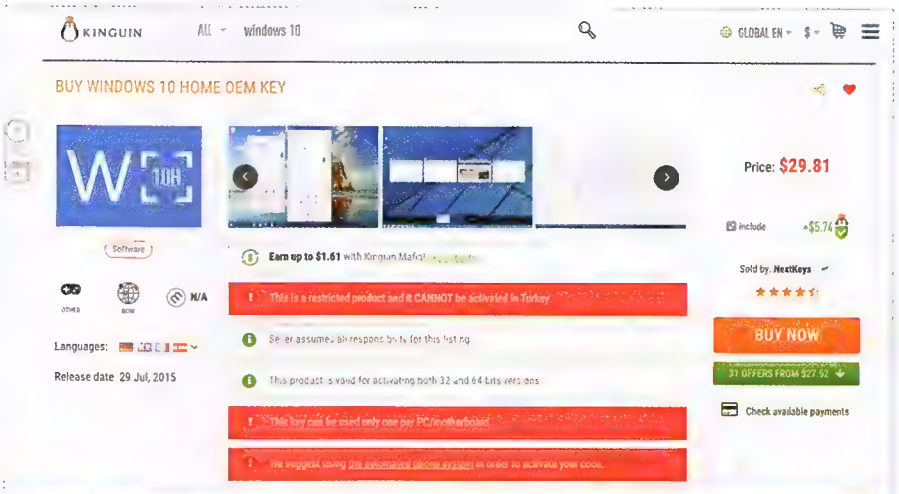
You can, first of all, install and run Windows 10 without activating it. Heading to **www.microsoft.com/en-au/software-download/windows10ISO** usually brings up Microsoft's media creation tool, although if you visit that site from another OS, such as Linux, you can download the ISO directly. To fix this, open the link in Microsoft Edge or Internet Explorer, press F12, enter the Emulation tab, and change your user agent string to pretend you're visiting from an iPad. You can now grab the ISO directly. Write it to a USB flash drive with Rufus (**https://rufus.ie**), head through the install procedure, and when asked to activate, select 'I don't have a product key'. If you're planning to upgrade to the activated version later – you can purchase a key through the Microsoft Store – make sure you opt to install the Home edition, rather than the more expensive Pro, unless you're sure you need the extra features of the latter. If you run unactivated, you have to put up with a watermark on your desktop, a limited selection of personalisation options, and no support – but you can do it. It's not going to stop working, and even unactivated installations are eligible for Microsoft's standard update program.

If you want to go straight, there's also the slightly unofficial but apparently rather effective route of installing Windows 10 using your existing Windows 7 key. If it's legitimate, it seems an old key generally works just fine, despite Microsoft outwardly dropping its upgrade scheme, though we're not offering any concrete assurance here, as certain keys may not work at all. Check your hardware for a certificate of authenticity sticker, or run Nirsoft's ProduKey (**www.nirsoft.net**) to dredge up the key from your existing installation if you don't already know what it is.

Bear in mind that using an older key on a new install invalidates it on the old one, so dual-booting isn't an option in this case. If you run into problems, it may well lock out the key on both ends, meaning you'll need to make an uncomfortable call to Microsoft Support to sort it out – do this before Windows 7 is trashed, in case you need to step back, and again make sure that everything you care about is archived away from either machine before trying it.

UPGRADE TIME

Perhaps you've been clinging on to Windows 7 because you feel your current hardware can't keep up. That's



Bag a bargain

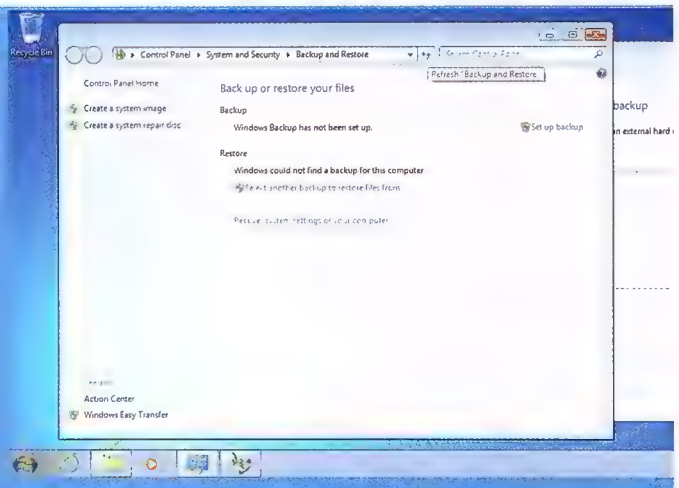
Psst, over here – we hear you're looking for a sweet deal. Take a look inside the stained trench coat of a third-party key retailer, and you might be surprised: a Windows 10 key, generally overstock sold on from a wholesale bulk buy, or sometimes a key bought with a cheaper foreign currency and passed down the line, could cost you as little as US$20. While we're not trying to discourage you from heading to a site like **www.kinguin.net**, **www.pcdestination.com**, or even a big retailer like Amazon or Newegg in search of a cheap key, there are a few things that you need to beware of.

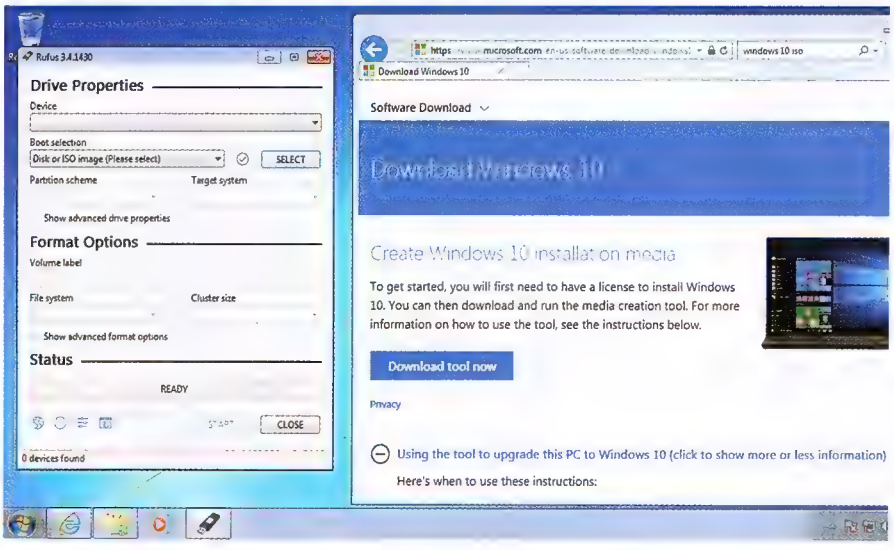
This is risky. We're not you cling for any of these sites because there's a small chance the key you buy could be illegitimate or double-sold. It's wise to opt to shop with a business that might offer a refund if all goes wrong, and that doesn't include Amazon or Newegg, whose key sales are final – if there's a problem on these sites, you need to take it up with the individual seller. Some charge a premium for refund protection – Software Pug (**https://softwarepug.com/**) asks for an extra US$20, which also includes installation support.

There's no specific legal impediment to buying a key in this way. Retailers claim it isn't even a grey market – more the equivalent of picking up a key from a dusty local PC shop rather than selecting an artisanal key from John Lewis. You'll certainly have the best recourse should you buy from Microsoft directly, but if you want to take an unactivated Windows 10 install legit, you could do worse than dropping a few dollars on a third-party key.

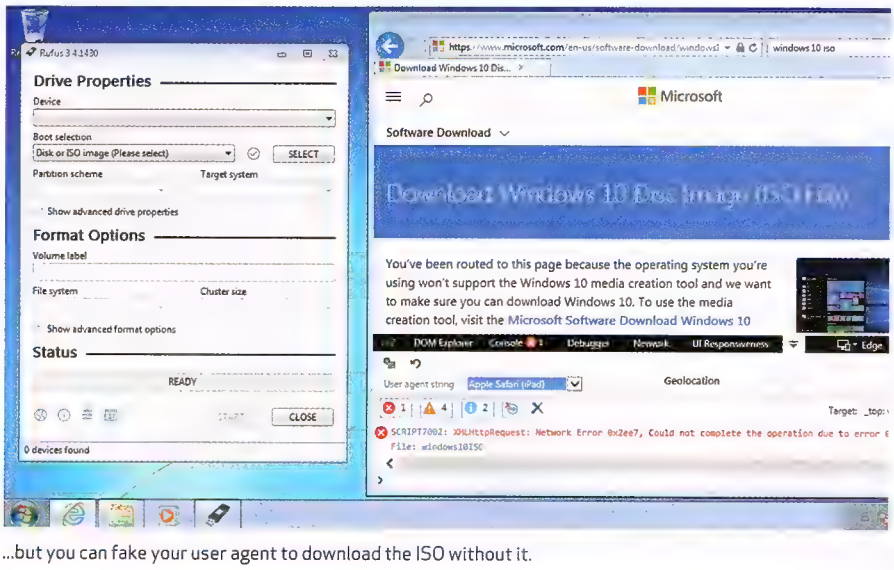
Want to play *Overwatch?* With Wine, it's possible to run the Windows version on Linux.

Back it up


Control Panel ▸ System and Security ▸ Backup and Restore
Control Panel Home
Back up or restore your files
Create a system image
Create a system repair disc
Backup
Windows Backup has not been set up.
Set up backup
Restore
Windows could not find a backup for this computer
Action Center
Windows Easy Transfer


Rufus 3.4.1430
Drive Properties
Device
Boot selection
Disk or ISO image (Please select)
SELECT
Partition scheme
Target system
Show advanced drive properties
Format Options
Volume label
File system
Cluster size
Show advanced format options
Status
READY
CLOSE
0 devices found
Download Windows 10
Software Download
Download Windows 10
Create Windows 10 installation media
To get started, you will first need to have a license to install Windows 10. You can then download and run the media creation tool. For more information on how to use the tool, see the instructions below.
Download tool now
Privacy
Using the tool to upgrade this PC to Windows 10 (click to show more or less information)
Here's when to use these instructions:

Want to download a plain Windows 10 ISO? The media tool wants an existing license...


Rufus 3.4.1430
Drive Properties
Device
Boot selection
Disk or ISO image (Please select)
SELECT
Partition scheme
Target system
Show advanced drive properties
Format Options
Volume label
File system
Cluster size
Show advanced format options
Status
READY
CLOSE
0 devices found
Download Windows 10
Microsoft
Software Download
You've been routed to this page because the operating system you're using won't support the Windows 10 media creation tool and we want to make sure you can download Windows 10. To use the media creation tool, visit the Microsoft Software Download Windows 10
Geolocation

...but you can fake your user agent to download the ISO without it.

probably not true; we've managed to run Windows 10 on machines as lowly as old netbooks, and it's performed reasonably well on everything we've tried. In fact, the listed minimum requirements for both Windows 7 and Windows 10 are identical – a 1GHz processor, 1-2GB RAM, 16-20GB of drive space, and a DirectX 9-compatible graphics card. What runs on one should run on another. Credit to Microsoft for streamlining its latest OS; if you previously gave Windows 8 or 8.1 a go and rolled back in disgust, you won't find the same performance hang-ups with 10, although those minimums are just that. We recommend hardier hardware – at least a 2GHz dual-core CPU, at least 4GB RAM, and far more than the stated drive requirements if you're partial to keeping any files at all on a PC that doesn't grind to a halt at a moment's notice.

That said, you may be looking at Windows 7's current place in front of the firing squad as an opportunity to pick up some new hardware. We'll leave recommendations for specific upgrades to other features, particularly since just about anything you buy today will be up to the task, but it's worth considering that Microsoft's authentication tools look at the makeup of your system components to determine the validity of your key – if you're building your own PC, or making big changes to an existing one, it helps to have your Windows key tied to your Microsoft account, so you can use the Activation troubleshooter to

iron out any problems.

On Windows 10, head to Settings > Update & Security > Activation to check if you're linked – you'll see 'Windows is activated with a digital license linked to your Microsoft account' if so. If it's not working, first head to Settings > Accounts > 'Your info', and confirm you're logged in to Windows 10 as an administrator using your Microsoft account, then head back to the Activation panel. Fire off the Troubleshooter, let it know you've made hardware changes, and enter your account details. Select the package of hardware you're using, and Windows will reassign itself to your new device.

PENGUIN POWER

If you're already chipping away at the Windows coalface for hours on end, you might as well make fighting with your OS a full-time job, and move the whole shebang to Linux. Facetious setup aside, Linux does have a bunch of benefits. For one, it's free – no expensive or potentially shifty keys to buy – and you're all but guaranteed to never reach any sort of End of Life state, as long as you're not running some obscure distro with shaky support behind it. That means, as long as you don't fight off security updates, your OS will be kept secure by the teams of developers who maintain Linux distros, and since (as a platform) it's less common in the wild than Windows, not to mention more difficult to attack, driving a Linux box is likely a safer way to run a PC.

Linux can be great for lower-end systems that won't be able to keep up with the pressures of running Windows 10. If you're upgrading (far too late) from Windows XP or Vista, a low-end distribution is a great choice to restore at least some functionality to dusty old hardware – see the 'Low-end Linux' box (right) to find out more. If you have sprightlier hardware, there are a host of mature and highly capable distros that can ease you into Linux nicely; avoid the likes of Arch Linux (too obtuse) or Gentoo Linux (so complicated to build and install that you'll have grown a Linux guru beard before even hitting desktop), and lean more toward the likes of Ubuntu Linux or Linux Mint, two Debian-based distros geared toward simplified desktop use. The latter, in particular, has a default interface that'll be familiar to Windows veterans.

There are some obvious downsides to going Linux. Windows apps aren't natively compatible, so you'll lose your current catalogue. There are generally free alternatives available to most Windows applications that do the job just as well – LibreOffice in place of Microsoft Office, for example – although you may find the odd bit of functionality missing. If you really must use Windows apps, the majority of them can be wrapped in a compatibility layer using Wine (**www.winehq.com**), which should make them run as if you were firing them up natively on Windows.

Linux is also a rather poor choice if you use your PC for gaming. Despite Valve's best efforts with SteamOS and the like, it hasn't taken off as a Steam-friendly platform – there's a decent catalogue of games, but Windows is (and will remain) the PC platform of choice for the latest titles and the latest GPU driver updates, meaning it'll almost always be more stable and more up to date. Wine is, again, an option, though it isn't hugely helpful in this regard; although it does support DirectX, the extra compatibility layer means your PC will take a performance hit. Games – including modern AAA titles – run fine as long as you install the latest Wine staging patches, which detail exactly the kind of setup they're looking for. ■

Old hardware can be revitalised with the likes of Lubuntu
Mozart - II movement
tears_of_steel_1080p.webm - GNOME MPlayer
Enable
Low-end Linux

System News

Feeling lit? Mark Williams sheds some light on the darker side of RGB.

Love it or hate it, RGB lighting to bling up your PC is here to stay. If, like me, you've been blissfully ignoring the RGB revolution going on when it comes to turning the innards of your PC build into a Nyan Cat dance party, you might be surprised at how difficult setting up a fully coherent lighting setup can be.

RGB LEDs have been in production for quite some time and even cooling fans sporting different colours aren't new; however the craze that is addressable RGB (aka ARGB), which is programmable by software, has really taken off in the past couple of years, to the extent that everything inside your case can be RGB-ified. Motherboards, graphics cards, LED strips, AIO water blocks and of course fans are the typical examples, but there are now even RGB SSDs (both M.2 and 2.5-inch SATA), memory sticks, power supplies and even the power cables themselves that plug into the motherboard! Nothing is sacred – everything can be RGB lit.

Getting all those things and slapping them into a single system build is entirely doable, however if you did, you could be looking at up to five (or even more) software applications to control them all, and a literal bucket load of RGB cabling to hide away inside your case and, even then, the worst part is that all the lighting effects wouldn't even be in sync with each other (assuming you're not going with just a static colour theme).

You see, the ARGB marketplace is split up into mini ecosystems, presumably because all the manufacturers want to create their own vendor lock-in to steer you towards buying their own RGB-ified products.

The four main motherboard manufacturers have their own software and compatibility lists with products – those ecosystems are respectively Asus Aura Sync, Gigabyte RGB Fusion, MSI Mystic Light Sync, and ASRock Polychrome. As every PC has a motherboard, these four ecosystems are the most widely supported by other third-party products, so going with one of these to drive and sync your PC internals makes a lot of sense.

Then you have PC parts, peripheral and case manufacturers that have their own ecosystems too – and not all of these can be attached to your motherboard's ARGB header for control. So, the likes of Corsair and its iCue software, NZXT's Hue and Thermaltake's RGB Plus all give you control over things like keyboard, mouse and all-in-one coolers and fans, but are themselves isolated ecosystems with no interoperability with any other.

It's all a bit of a mess. For example, ARGB headers for motherboards vary – they can be 5v or 12v, and 4- or 5-pin – and some fans and LED strips can be daisy-chained together, but others require a physical hub to connect into for control… and these often have proprietary connectors, further restricting interoperability. If you want a unified colour control scheme using parts from different manufacturers, attempting to get everything looking and flashing the same becomes a considerable challenge.

As our expert from Leader Computers this month suggests, then, for best results (and your sanity) you should try and stick as much to a single vendor for your RGB products as possible. You'll need to do your research first before diving in.

SHOP TALK

What are your thoughts on the various RGB ecosystems at the moment?

Gabriel, Leader Computers:
"In today's market it can get overwhelming with the amount of RGB hardware and features out there, but it's always best to do some research or to speak to a bricks-and-mortar shop, who will spend some time in helping you out.

We can see that the moving trend is vendors now bringing out their own RGB products – RAM/motherboard M.2 plates and even SSDs with RGB features – these work fantastically well when you focus on a themed build and can make your setup experience easy and smooth.

The good thing to keep in mind is that there's a LOT of information online on forums and in PC literature – check both lighting-focused sites and vendor forums, too.

*The gaming community can be a great source of information, I always check sites such as PC Gamer (**www.pcgamer.com**) for product recommendations and then read the community comments and feedback – most of the time someone has already expressed their experience, good or bad, and you can use this to help you make your choices easier. Remember to never be afraid to ask the gaming community on forums.*

RGB is out of its infancy stage and we are entering the world of vendor-themed PC builds, so the RGB market will only get easier and cheaper as time goes by.

If you're deciding to install RGB lighting in your system, its best to do it all in one go and all in the same brand. The exception to that is RGB memory, however vendors are very active in listing compatibility charts, so you are never left in the dark (pun intended)."

Market Snapshot

A sampling of PC systems available this month.

JW Computers GMR X5000-2080Ti Zeus

$5,399 TINYURL.COM/APC469JWD

Zeus, the god of gods, a somewhat fitting name for this god-like gaming machine. It has Intel's best consumer CPU available in the i9-9900K, nicely paired with a 360mm water cooler to keep all that godly power cool and quiet, not to mention giving cooling overhead for overclocking. Also included is the almighty RTX 2080 Ti for gaming performance worthy of old Zeus himself. 32GB of RGB RAM, while overkill for gaming these days, does afford some future proofing and opens up options for power users. Speaking of RGB, there's lots of it thanks to the nine RGB fans, AIO, PSU and RAM sticks. Unfortunately, the video card has a lighting strip with a fixed colour gradient on it which might grate at those wanting high levels of RGB control.

KEY SPECS: CPU: Intel Core i9-9900K, Cooler: Thermaltake Water 3.0 360mm ARGB Sync, Motherboard: Asus Z390-F ROG Strix Gaming, Graphics: Asus Turbo RTX2080Ti 11GB, Memory: 32GB DDR4 3200Mhz RGB, Storage: Intel 660P 512GB M.2 NVMe SSD, Seagate BarraCuda 3TB SATA HDD, Power Supply: CoolerMaster MWE 750W, Case: Thermaltake View 71

Shopping Express AMD Ryzen 7 2700X RX580 8GB Gaming System

$1,549 TINYURL.COM/APC469SHO

Serving up copious amounts of compute power doesn't have to cost the earth; packing an 8-core 16-thread AMD CPU this system has lots of brawn for your productivity needs. The RX580 graphics card is good enough for 1080p gameplay in most big game titles, or even 1440p with less-demanding and e-sports games. Something to take note of is the single 240GB SATA SSD for mass storage. Given the chance, games these days can quickly fill that up, and being just SATA, it's on the lower end of performance. Still, it's better than a hard drive any day. The 550W PSU might prove restrictive if you're looking at beefier upgrades down the road, however.

KEY SPECS: CPU: AMD Ryzen 7 2700X, Cooler: Wraith Prism, Motherboard: Asus ROG Strix B350 F Gaming, Graphics: Gigabyte AORUS RX580 8GB, Memory: Kingston 8GB DDR4 2400MHz, Storage: WD Green 240GB SATA SSD, Power Supply: Thermaltake Litepower Gen2 550W, Case: Cooler Master, MasterBox Lite 5 RGB Tempered Glass

CPL Online Rejuvenescence7 Ryzen 7 GTX2070

$2,399 TINYURL.COM/APC469CPL

Tempered glass, ray tracing, RGB, NVMe... they're the hottest buzzwords in PCs at the moment, and this system has them all. Well almost. Unfortunately, the M.2 SSD is only a SATA spec. Is seems this was one area this build tried to save some money with. Sure, there's a 3TB HDD to back it up, but most people would appreciate a snappier NVMe 500GB drive instead. With plenty of processing power on tap CPU-wise and an upper end graphics card in the RTX 2070, this system can do pretty much anything you could think of, even 4K gameplay if you can sprinkle in some DLSS magic.

The generous power supply gives plenty of scope for upgrades and overclocking. A solid system to expand upon in future.

KEY SPECS: CPU: AMD Ryzen 7 2700X, Cooler: Wraith Max RGB, Motherboard: MSI X470 Gaming Pro Carbon, Graphics: MSI GeForce RTX 2070 Armor 8GB, Memory: Corsair Vengeance LPX 16GB DDR4 2666MHz, Storage: WD 250GB Blue M.2 SATA SSD, SEAGATE Barracuda 3TB SATA HDD, Power Supply: Thermaltake 750W ToughPower, Case: Thermaltake View 71 Tempered Glass RGB

Dcomp Computers Intel Level VII

$2,750 TINYURL.COM/APC469DCO

More expensive than the Rejuvenescence7 PC, this system takes two steps forward for gamers but, then, one giant step backwards. The Intel Core i5-9600K CPU here is better suited to gaming at the moment than AMD's Ryzen 7 2700X thanks to Intel's higher clock speeds, plus a sweet NVMe SSD will give some great level loading times. However, the faster legs this CPU has for gaming are hampered by a cut-down graphics card in the RTX 2060. Down on CPU grunt for productivity, and down on graphics power for games, all the shiny RGB-ness in the world isn't going to save this system's poor performance per dollar rating. There are better-balanced options at this price point.

KEY SPECS: CPU: Intel Core i5-9600K, Cooler: Thermaltake Water 3.0 240 ARGB Sync, Motherboard: ASUS Z390-F, Graphics: Asus Strix RTX 2060 6GB AURA, Memory: G.Skill Trident Z 16GB DDR4 3200 MHz RGB, Storage: Samsung 970 EVO Plus 500GB NVMe M.2 SSD, Power Supply: Thermaltake Tough Power GF1 650W, Case: Thermaltake View 32

PC blueprints

The *APC* team's picks for a part-by-part perfect PC build to suit your budget.

PARTS LIST

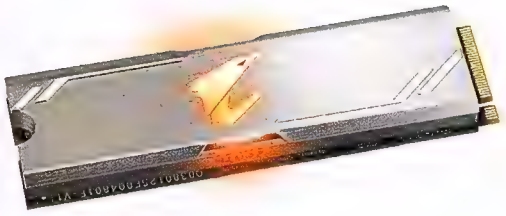
PART		PRICE
CASE	BITFENIX NOVA TG	$75
PSU	450W CORSAIR VS450 80+	$64
MOTHERBOARD	ASROCK B450M R4.0 AM4	$95
CPU	AMD RYZEN 5 2600	$245
GPU	GIGABYTE GEFORCE GTX 1660 6GB	$389
RAM	8GB (2X 4GB) TEAM T-FORCE DARK 3200MHZ	$109
SSD	120GB CRUCIAL BX500 2.5-INCH SSD NEW	$33
HDD	1TB WD BLUE 3.5-INCH HDD	$59
OS	UBUNTU DESKTOP LINUX 18.04 LTS 64-BIT	$0
APPROXIMATE PRICE:		$1,069

There wasn't too much work to be done on the budget build this month. We managed to find our Asrock B450M motherboard discounted at several shops, with Umart pricing it competitively at just $95 – down from $119 a month ago. Elsewhere we were able to trim the fat a little – swapping out our Adata Ultimate SSD for a Crucial BX500 of the same size saved us a few dollars. Most other components held steady this time around, with our final tally showing an overall price reduction of thirty dollars compared to last month's build.

PARTS LIST

PART		PRICE
CASE	FRACTAL DESIGN MESHIFY C	$149
PSU	550W CORSAIR CX550M 80+ BRONZE	$99
MOTHERBOARD	ASUS ROG STRIX B450-F GAMING	$209
CPU	AMD RYZEN 7 2700	$359
COOLER	COOLER MASTER MASTERLIQUID LITE 240MM RGB AIO NEW	$89
GPU	ZOTAC GAMING GEFORCE RTX 2060 6GB	$569
RAM	16GB (2X 8GB) TEAM T-FORCE DARK 3200MHZ	$179
SSD	250GB SAMSUNG 970 EVO PLUS M.2 PCIE SSD	$119
HDD	1TB WD BLUE 3.5-INCH HDD	$59
OS	WINDOWS 10 HOME 64-BIT OEM	$140
APPROXIMATE PRICE:		$1,971

A sudden, unwelcome hike in the price of Corsair's H100i Pro 240mm RGB all-in-one cooler (from $159 last month to $226 now!) had us re-evaluating our mid-range build this month, eventually opting for a far more affordable (if slightly less flashy) option: Cooler Master's MasterLiquid Lite – try saying that five times fast. Cooler Master lives up to its name; similar in scale to the Hydro H100i Pro we had been using, the MasterLiquid Lite comes packed with RGB lighting and produces minimal noise. Oh, and it's $67 cheaper than Corsair's offering.



UPGRADE OF THE MONTH

512GB Gigabyte Aorus RGB M.2 NVMe SSD

$182, WWW.GIGABYTE.COM

RGB on your SSD? Sure, why not? Honestly, we love this little drive for other reasons: It's speedy enough to compete with Samsung's dominating M.2 SSDs, with a sleek integrated heatsink. This is the first SSD to come with motherboard-compatible RGB lighting, so if you're rocking a modern Aorus motherboard, you can link them together for bonus bling. Otherwise, Gigabyte's RGB Fusion 2.0 software is freely available. The 512GB model offers up to 3,480/2,000MB/s read/write speeds, and comes with a five-year warranty, making the $182 price tag all the more attractive – already a surprisingly affordable price for a fast, flashy M.2 drive like this.

"_making the $182 price tag all the more attractive – already a surprisingly affordable price for a fast, flashy M.2 drive like this."

Threadripper CPUs have held steady in price – the 2950X is a relatively inexpensive one – but it's perfect for this build, delivering the price/performance balance we're seeking, so once again it remains in the Turbo PC. Our Asus Turbo GeForce RTX 2080 remains remarkably good value, and it gets even better this month with the price dropping from $1,099 to $1,049 (from Mwave, with most other major shops having it $10-$20 more expensive).

The biggest saving, though, was made on the SSD. Samsung's 970 Pro is a lightning-fast drive, but it comes with a price tag that leaves us feeling like we've been lightning-struck; we saved nearly 50 dollars by moving to the 512GB Gigabyte Aorus RGB M.2 SSD, released earlier this year. RGB on an M.2 drive might seem a little over the top, but this SSD is a nifty piece of gear with a sensible price and that's why it's being included. The RGB tech gave Gigabyte room to include a heatsink on the top of the SSD, meaning there's no need to shell out for motherboards that come with removable M.2 heat shields. No fiddling around with sticky pads, either. WD's HDDs mercifully didn't rise in price, so our 2TB of reserve storage remained safe. Overall, this build came out $68 cheaper than last month – and probably about 10 percent more colorful.

PARTS LIST

PART		PRICE
CASE	NZXT H700I	$259
PSU	750W CORSAIR RM750X 80+ GOLD	$175
MOTHERBOARD	ASROCK X399 PHANTOM GAMING 6	$299
CPU	AMD THREADRIPPER 2950X	$1,399
COOLER	BE QUIET! DARK ROCK PRO TR4	$155
GPU	ASUS TURBO GEFORCE GEFORCE RTX 2080	$1,049
RAM	32GB (2X 16GB) TEAM T-FORCE DDR4 @ 3200MHZ	$379
SSD	512GB GIGABYTE AORUS RGB M.2 NVME **NEW**	$182
HDD	2X 2TB WD BLUE 3.5-INCH HDD	$118
OS	WINDOWS 10 HOME 64-BIT OEM	$140
APPROXIMATE PRICE:		$4,155

Dawn of the GeForce 1660 Ti

With the GeForce GTX 1660 series arriving, we're aiming to build a 1080p gaming powerhouse for $1,500.

Ah, the long-awaited arrival of the GeForce GTX 1660 Ti. We've been waiting for this for a while, and it's great to see it finally here. A mainstream GPU that strikes the perfect balance between price and power, the GeForce GTX 1660 Ti is Nvidia's new mid-range graphics card, capable of delivering top-notch 1080p gaming while wisely dropping superfluities such as ray-tracing support to keep the cost at a very affordable level. And now that it's arrived, we're itching to get it into a new build.

We're going with the slightly pricier MSI Gaming X GTX 1660 Ti for this build, netting us better performance – but the regular 1660 will work just fine, too, if you're trying to make a small saving. The mission was simple: Assemble a fierce 1080p gaming machine for fifteen hundred dollars. Pushing it to higher resolutions isn't important here; frame rate and general performance are the name of the game. Because of this, we were able to go for slightly more conservative pickings for the processor, motherboard, and RAM – as is often the case, the GPU is most certainly the champion of this build.

And what a champion it is. The 1660 checks in at a comparable price to the older, slower GTX 1060, while this Ti variant is faster, and handles overclocking well. It might sit below the RTX models in speed, but with 6GB of memory and trimmed fat in other areas, too, it's excellent bang for your buck. Keeping the price down proved tricky when taking storage into consideration, but eventually we had a list of ingredients. The only thing left was to, as the title goes, was go ahead and build it.

"The 1660 checks in at a comparable price to the older, slower GTX 1060, while this Ti variant is faster."

HITTING THE BUDGET

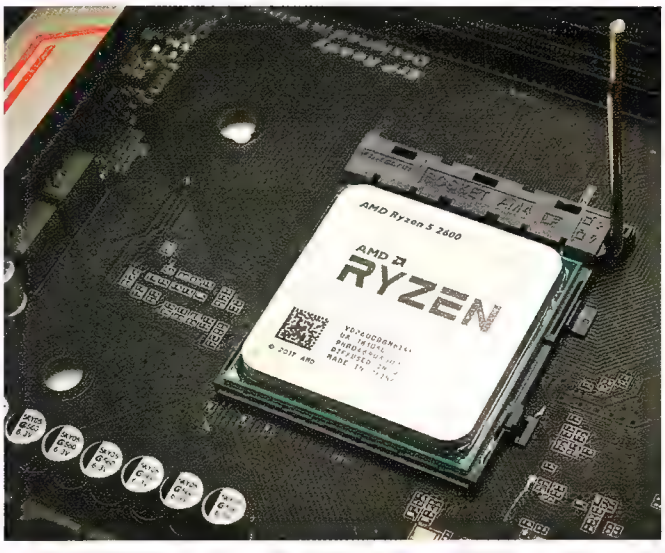
Our aim was to piece together a machine for under $1,500, and we rolled in at $25 under this (although prices are in constant flux, so that may have changed by the time you read this). There are plenty of ways go even further under this budget, from halving the memory on offer to using a stock GTX 1660 Ti, as opposed to this overclocked version. The more enterprising among you may wish to give a Linux-based OS a shot – don't let us tell you what to do (except for in the steps below, of course).

To store everything away, we've got a budget case from Phanteks, the Eclipse P300. Inside that, we're throwing in an X470 Aorus Ultra Gaming motherboard from Gigabyte, supporting a Ryzen 5 2600 processor. Its six cores mean this PC will still be able to handle more demanding software, and like most Ryzens, the chip comes with its own AMD-branded Wraith Stealth cooler, enabling us to save a few of our precious gold coins in the pricing department. These coolers aren't flashy, but they're relatively efficient and – more importantly – compact, making them good for smaller builds like this.

That's not all we're plugging into this motherboard; two sticks of G.Skill's Flare X RAM give us 16GB of memory at 3,200MHz, plenty for the vast majority of games and applications. The GeForce GTX 1660 Ti is front and center, of course. There's only a single storage drive in this build – an Adata Ultimate SU800. Packing half a terabyte of storage, this chunk of plastic and silicon is a great budget option, making it a good choice for OS booting, while still being capable of squirreling away plenty of those big games. Lastly, this build is powered by a Corsair CX450 PSU. There was no need to go flashy on the power supply – prices have jumped up a little lately, so sticking with something simple was the way to go.

PARTS LIST

PART		STREET PRICE
CASE	PHANTEKS ECLIPSE P300	$89
MOTHERBOARD	GIGABYTE X470 AORUS ULTRA GAMING	$259
CPU	AMD RYZEN 5 2600	$245
CPU COOLER	AMD WRAITH STEALTH	N/A
GPU	MSI GAMING X GTX 1660 TI	$419
MEMORY	16GB (2X 8GB) G.SKILL FLARE X @ 3,200GHZ	$155
PSU	450W CORSAIR CX450	$69
STORAGE	512GB ADATA ULTIMATE SU800	$99
OS	WINDOWS 10 HOME 64-BIT	$140
TOTAL		$1,475

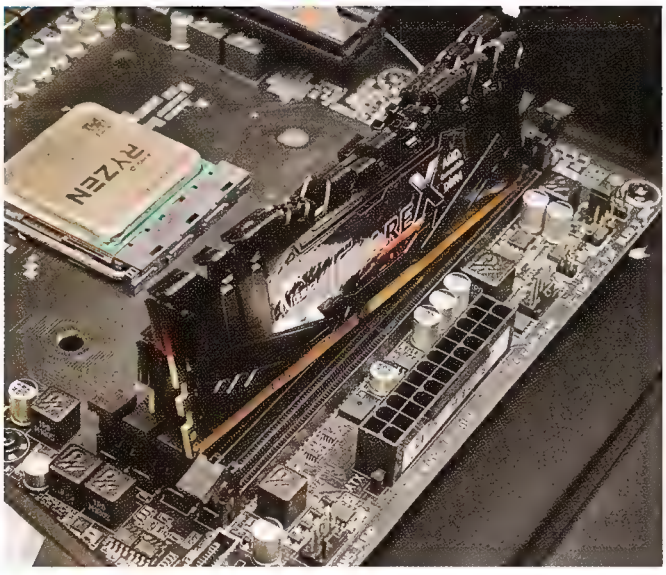


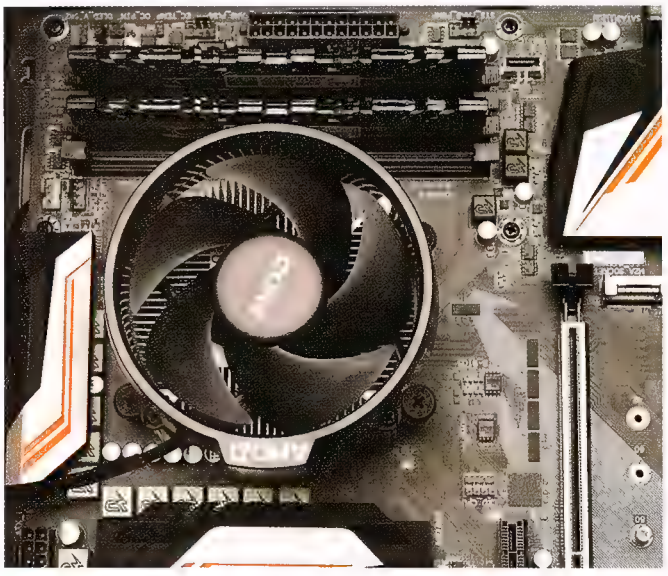
1 THUMB WARS

Considering its price, the Phanteks Eclipse P300 is a tasty little case to work with. Stripped down, it's a minimalistic affair; the side panels (one metal and one glass) can be removed by hand, thanks to their chunky thumbscrews. The front panel pops off with a little exertion to reveal the HDD cage, though we won't be needing access to that for this particular build. The PSU shroud is solid, which will keep the visible guts of this build nice and tidy. The metal side panel can be a hassle to fit back on, however, because it has guidance clips that need to latch into nine separate slots before it can be screwed in. The easiest way to do this is to fit the panel into the bottom three slots first, then line up the top before sliding it along toward the front of the case. These thumbscrews are rather unlikely to go back in with just your thumbs, so a screwdriver might be needed here. The P300 also comes with a Phanteks 120mm fan fitted at the rear – we got our grubby mitts on another one for a few dollars, and screwed it in at the front.

2 DARK KNIGHT RYZES

We start with the motherboard outside the case. This X470 is a quality mobo, laid out simply, with no fancy thermal guards, and little in the way of the usual "gamer" motifs. If you don't have a dedicated test bench for PC building, setting it atop the box works just fine for this step. Ryzen CPUs are easy to install, manageable even by the most junior of builders: Just lift the clasp, carefully place the processor on to the socket, and lower the clasp back into place. Be sure to line up the highlighted corner on the CPU with the one on the motherboard, indicated by a small triangle. If you've elected to use an M.2 drive, we recommend installing it at this point as well, although as these tend to demand a premium over SATA drives, we've decided to go the cheaper route here.





3 SQUEEZED IN

Before mounting the mobo, fit the rear I/O shield that comes with it into the case. Then it's simply a matter of placing the motherboard inside the case; fit it on to the location peg, and make sure all the rear I/Os are lined up before screwing it down. The P300's pre-fitted fan can be cumbersome, as the mobo needs to fit beneath it; beefier mobos would demand relocation of the fan. As it stands, the X470 fits in under it, but it's a tight squeeze, leaving the top of the rear I/O block almost flush with the rear fan. If you're struggling, unscrew the fan from the back panel and refit it once the motherboard is installed. Once in place, we installed the RAM. As usual, this was a cinch; open the clips on both sides, slot in each stick, and push it down until the clips snap back into place.

4 PRICE FREEZE

We are using the stock cooler that comes with the Ryzen 5 2600 – overclockers may scoff, but this build doesn't need to do any real heavy lifting, and the cooler comes at no extra cost. It's small and fairly straightforward to install, with plenty of space even in a smaller case to screw down the four spring-fitted screws. Keeping the cooler bracket steady underneath the motherboard had us wishing we were packing an extra hand or two, but if you're doing this solo, your best bet is to prop up the bracket with a small object until you've got at least one screw in place. These screws aren't particularly long, and the springs keep them sitting at the top of their brackets, so you might need to apply some pressure with your screwdriver to get them to catch.

5 APPLE OF MY TI

Next, the prime piece of this build. MSI's GTX 1660 Ti is perhaps more expensive than stock models, but it's a slick piece of gear. With Twin Frozr 7 thermal design, it's guaranteed by MSI to run cool and quiet, and comes with flashy RGB lights around the fans. This goes in easily enough – first, though, you need to remove the bracket covering the rear GPU I/O shields. Two of these shields need to come out, and while the bracket does slide up to give you a little room, removing it entirely is far easier. Keep the case on its side for this section; the GPU slots in above the M.2 slot, then screws in to the rear of the case. Don't forget to replace the bracket afterward – slide it in from the outside of the case, before securing it with the thumbscrews provided.

6 POWER STRUGGLE

Last into the case are the power supply and SSD. The PSU is straightforward: Once it's screwed into the backplate, the cables need to be fed through and plugged into the motherboard and GPU. This can be tricky, as the gaps for the cables in this case are small. Fortunately, there's some room behind the motherboard and beneath the PSU shroud for loose wiring to be tucked away. There aren't too many wires to contend with here, with only the SATA drive requiring some careful routing. The case does support Phanteks's own lightstrip tech, should you wish to spruce things up with some LEDs, but as we're not using it those cables can be neatly packaged along with the feeds from the front I/O – Phanteks provides Velcro straps with the case for tidying up your internals. Side panels back on (carefully!), and we're wrapped up.

1 AMD's own Wraith coolers come packaged with most CPUs. These are pretty small affairs, but they do the job well enough, and save you a few bucks. As you might have guessed, we've got quite a surplus of them in the office.

2 The mounting plate is solid metal – no rubberised slots to feed cables through here. Fitting the bulkier power cables through these holes proved a bit of a squeeze, so be careful not to damage them.

3 MSI's GTX 1660 Ti Gaming X is a sweet-looking piece of gear that produces some decent graphics. More budget-friendly options are available, but you'll miss out on a factory overclock if you go down that route.

Ready for action

Getting this build running was unexpectedly tricky. Gigabyte motherboards can be capricious, and this X470 was no exception; upon loading Windows and investigating, we found that our 3,200MHz RAM was running at just 2,400MHz. Cue a venture into the BIOS setup, where we struggled to locate anything that would help – bizarrely, though, upon restarting, the memory was running at full speed, despite us not changing any settings. Sometimes, jumping into the BIOS is all that's needed.

The lack of a proper M.2 drive in this build means it's not the fastest thing imaginable when it comes to storage bandwidth, although the Adata SU800 is a reliable piece of hardware that won't demand replacing anytime soon – unless we decide to upgrade to a M.2 drive, the main thing we'd like to change about this build. That'll drive up the price of this PC significantly, but serious gamers might want faster load times. Bear in mind that this build only has enough PCIe lanes for one M.2 SSD – if you want to fit yours in the secondary M.2 slot, you need to change which port is prioritised in the BIOS.

For 1080p gaming, the 1660 Ti is a budget-friendly beast, powering through our benchmark tests, and performing well for online gaming. This build isn't going to be blasting 4K-quality rendering out, but it's efficient and quiet. While it's not an RTX GPU, a recent update made ray tracing available on this and the previous generation of GTX graphics cards – however, the trade-off in frame rate isn't even close to worth it.

The Eclipse P300 is great to work in; compact, well designed, and minimalistic, but with enough space to fit bulkier internal builds than this. Were we to keep sprucing this build up, we'd likely opt to drop a third 120mm Phanteks fan in the front, and the P300 also comes with a small integrated RGB light unit on the glass-paneled side. For those looking for a gaudier display, the case can be fitted with Phanteks RGB lightstrips, or connected to a compatible motherboard with an RGB adapter for a bit of extra cash.

The glass side panel is great for showing off your build. There's plenty of space for cable management behind and beneath the motherboard, too, so it's not difficult to keep things tidy. We didn't use them in this build, but the case has two HDD brackets at the front, should you desire extra storage. There isn't much else we'd like to change – perhaps with a bit more cash, we'd have sprung for a more powerful CPU cooler, but the included AMD one worked just fine for our needs.

BENCHMARK RESULTS

	ZERO-POINT	THIS SYSTEM
CINEBENCH R15 MULTI (INDEX)	1,152	1,258 (9%)
CRYSTALDISK QD32 SEQUENTIAL READ (MB/S)	3,400	564 (-83%)
CRYSTALDISK QD32 SEQUENTIAL WRITE (MB/S)	1,720	524 (-70%)
RISE OF THE TOMB RAIDER (FPS)	60	98 (63%)
TOTAL WAR: WARHAMMER II (FPS)	46	60 (30%)
TOM CLANCY'S GHOST RECON WILDLANDS (FPS)	39	51 (31%)
3DMARK: FIRE STRIKE (INDEX)	11,101	14,114 (27%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

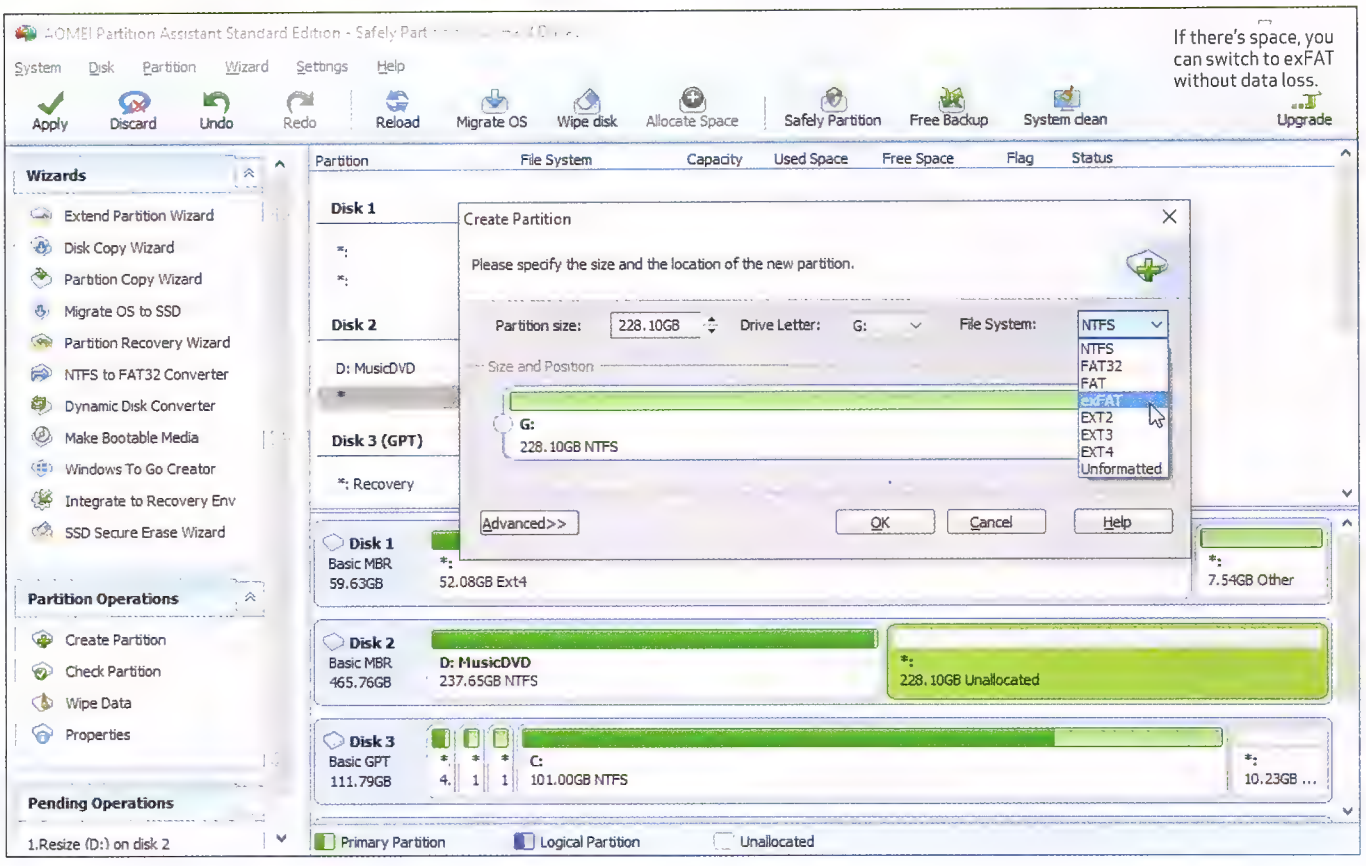
Our zero-point consists of an AMD Ryzen 5 1600, 16GB of Crucial Ballistix Sport LT @ 2,666MHz, an EVGA GeForce GTX 1060 3GB, and a 250GB Samsung 960 Evo M.2 PCIe SSD. All tests were performed at 1080p at the highest graphical profile.

how to

» QUICK TIPS

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.



STORAGE

EXFAT FILE CONVERSION QUERY

I have an external 3TB hard drive with 500GB of data on it, formatted as NTFS. Can I convert this to exFAT without losing any data?
Wayne Scowen

Sadly no – the recommended, and safest, option is to copy the files to another drive before reformatting the drive to exFAT, then copying or moving them back. If the drive is less than half full, however, another option would be to use a tool like AOMEI Partition Standard (free from **www.disk-partition.com**). Once installed, launch the program. Right-click the current NTFS partition and choose Resize Partition. Shrink the partition to free up enough space to fit your data on, then click OK. You'll see unallocated space appear next to the shrunk partition – right-click this and choose Create Partition – make sure its file system is exFAT, make a note of the drive letter it's been allocated and click OK again.

Review your changes and then click Apply to make them – be prepared to reboot if necessary. Once complete, move the data from your NTFS partition to your exFAT one, then reopen Partition Standard. Right-click the now-empty NTFS partition and choose Delete Partition. The quick option is best, so click OK. Now right-click your exFAT partition and choose Resize, this time using the slider to take up all the empty space to its left. Finally, click OK followed by Apply to complete the non-destructive switch.
Rob Mead-Green

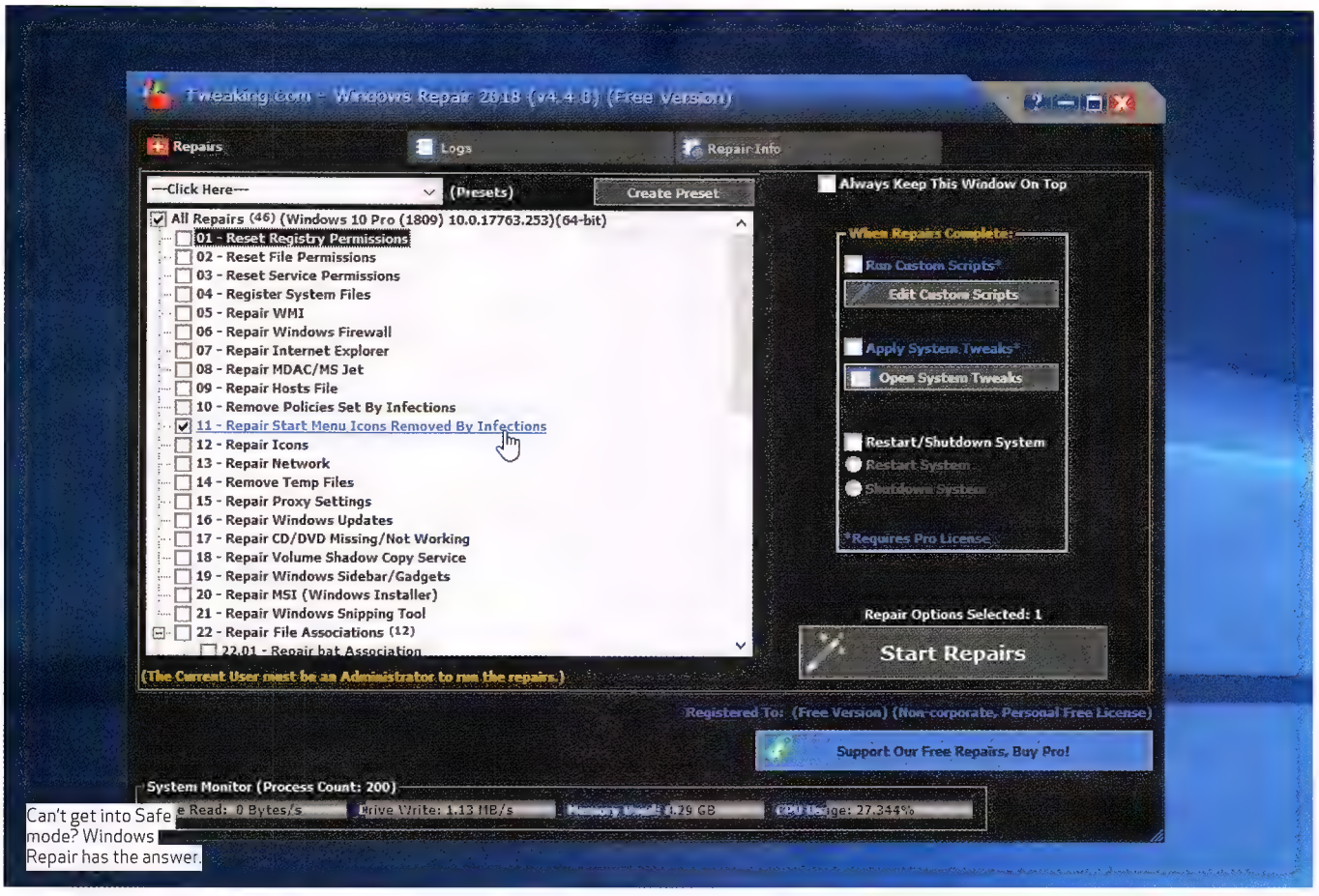
MICROSOFT OFFICE

MSG FILES WON'T OPEN

I saved some emails as MSG files in Outlook, but now I can't open them again. Is this linked to Microsoft's poor system for changing default apps?
Steph Henshaw

Steph was unable to choose Microsoft Outlook as the default choice for opening MSG files when she right-clicked them. In the end, though, she fixed her problem by performing a repair of her Microsoft Outlook installation – go to Settings › Apps, select Microsoft Office or Microsoft Outlook and choose Modify, then try the Quick Repair option first, followed by the more thorough Online Repair if it doesn't work – which restored Outlook as an option.

You don't necessarily need Outlook installed to read MSG files, however – there are many third-party viewers out there, including MailViewer (**www.coolutils.com/MailViewer**), which is completely free for personal use.
Catherine Ellis


Tweaking.com - Windows Repair 2018 (v4.4.8) (Free Version)
Repairs
Logs
Repair Info
---Click Here---
(Presets)
Create Preset
Always Keep This Window On Top
All Repairs (46) (Windows 10 Pro (1809) 10.0.17763.253)(64-bit)
01 - Reset Registry Permissions
02 - Reset File Permissions
03 - Reset Service Permissions
04 - Register System Files
05 - Repair WMI
06 - Repair Windows Firewall
07 - Repair Internet Explorer
08 - Repair MDAC/MS Jet
09 - Repair Hosts File
10 - Remove Policies Set By Infections
11 - Repair Start Menu Icons Removed By Infections
12 - Repair Icons
13 - Repair Network
14 - Remove Temp Files
15 - Repair Proxy Settings
16 - Repair Windows Updates
17 - Repair CD/DVD Missing/Not Working
18 - Repair Volume Shadow Copy Service
19 - Repair Windows Sidebar/Gadgets
20 - Repair MSI (Windows Installer)
21 - Repair Windows Snipping Tool
22 - Repair File Associations (12)
22.01 - Repair bat Association
When Repairs Complete:
Run Custom Scripts*
Edit Custom Scripts
Apply System Tweaks*
Open System Tweaks
Restart/Shutdown System
Restart System
Shutdown System
*Requires Pro License
Repair Options Selected: 1
Start Repairs
(The Current User must be an Administrator to run the repairs.)
Registered To: (Free Version) (Non-corporate, Personal Free License)
Support Our Free Repairs, Buy Pro!
System Monitor (Process Count: 200)
Can't get into Safe mode? Windows Repair has the answer.

WINDOWS
SAFE MODE WON'T OPEN

I hope you can help – I can't get into Safe mode on my Windows 10 PC.
Jemma McKenna

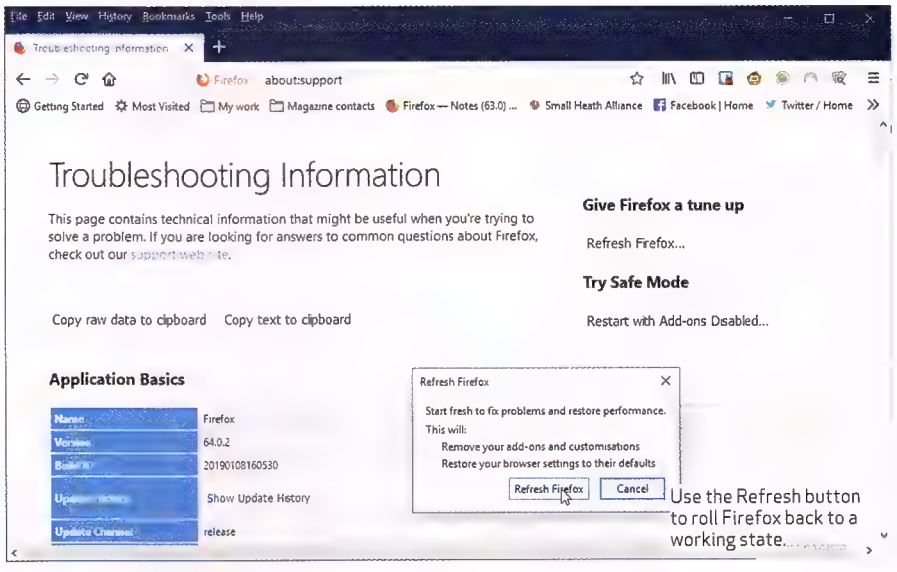
The normal route for Safe mode is to go via Settings > Update & Security > Recovery and click 'Restart now' under 'Advanced start-up'. Choose Troubleshoot > Advanced options > Start-up Settings to select Safe mode (we recommend the 'Safe Mode with Networking' option to retain Internet access). If this throws up an error, it sounds like the Safe mode Registry keys have been corrupted or removed – possibly by an infection. After verifying your system is clean using your anti-virus tool, download and run Windows Repair (**www.tweaking.com**). Go to the Repairs – Main tab and click Open Repairs. Select 'I understand the risks', then tick 'fix 11' before clicking Start Repairs. After this has been implemented, Safe mode should hopefully function again.
Mayank Sharma

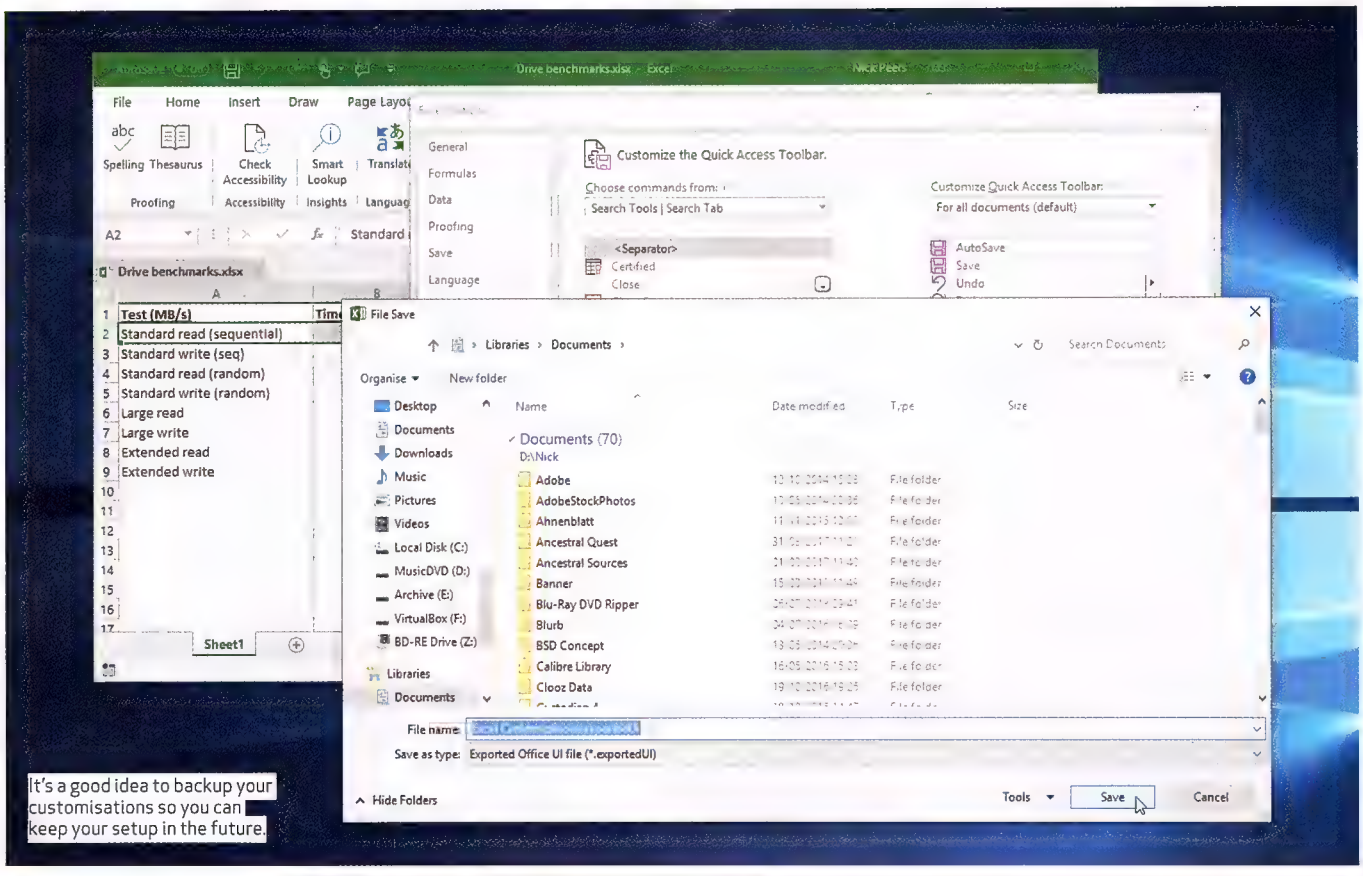
BROWSER
REFRESH FIREFOX

How can I get some order back into Firefox? Every time I open it, it seems to be scrambled.
Jim Duncan

Jim couldn't explain the nature of his particular problem to us – but we surmised that he simply wanted to roll things back to how they previously worked. Sadly, there's no option to restore your Firefox tabs and other settings to an earlier configuration in the way Windows' System Restore can, but as a last resort you can always restore Firefox to its default state without removing bookmarks, passwords, open tabs and other essential information.

To do this, open a new tab and type `about:support` into the Address bar to access Firefox's troubleshooting page. You'll see a 'Refresh Firefox…' button below 'Give Firefox a tune up' – click this and a pop-up dialog box will confirm what's being removed, namely all add-ons and browser customisations, plus resetting the browser preferences back to their defaults. Click the button again to complete the roll-back and hopefully Firefox will start to behave as you remember it.
Catherine Ellis


File Edit View History Bookmarks Tools Help
Troubleshooting Information
Firefox about:support
Getting Started Most Visited My work Magazine contacts Firefox — Notes (63.0) ... Small Heath Alliance Facebook | Home Twitter / Home
Troubleshooting Information
This page contains technical information that might be useful when you're trying to solve a problem. If you are looking for answers to common questions about Firefox, check out our support website.
Copy raw data to clipboard
Copy text to clipboard
Give Firefox a tune up
Refresh Firefox...
Try Safe Mode
Restart with Add-ons Disabled...
Application Basics
Name Firefox
Version 64.0.2
Build ID 20190108160530
Update History Show Update History
Update Channel release
Refresh Firefox
Start fresh to fix problems and restore performance.
This will:
Remove your add-ons and customisations
Restore your browser settings to their defaults
Refresh Firefox
Cancel
Use the Refresh button to roll Firefox back to a working state.



It's a good idea to backup your customisations so you can keep your setup in the future.

"The simplest way to make specific Microsoft Office tools more accessible is to add them to the Quick Access toolbar."

HARDWARE

OPTICAL DRIVES NO LONGER WORK

I have two DVD-RW drives and my PC has stopped recognising them. If I left-click either drive I get one of three errors: 'not available'; 'not accessible'; or 'access denied'. Can you help please?
Bil Levinson

Malfunctioning optical drives are often linked to permissions issues, but Bil also revealed that the Windows 7 Backup tool was failing to run, too, with an error about being unable to create a shadow copy. We asked him to connect various USB drives, and while an external DVD-RW drive threw up the same error, he had no issues accessing flash and external drives. Bil then worked his way through the official troubleshooting advice doled out by Microsoft only to find removing and attempting to reinstall the IDE/ATAPI drivers through Device Manager rendered his PC unbootable. His fail-safe backup – EaseUS – failed with a PCI device driver error, forcing him to reinstall Windows from scratch.

At this point Bil was given an error about the drive being MBR-formatted while the BIOS was UEFI (a common setup for compatibility reasons). Bil was able to fix this by converting the drive to GPT format by booting into the emergency command prompt through his Windows install disc – see **https://tinyurl.com/apc469-gpt** for instructions. After Windows was up and running again, Bil discovered that his DVD drives and Windows 7 backup tool were now working perfectly as well, confirming that it had been a Windows issue all along.
Ian Sleightholm

OFFICE

MAKE TOOLS MORE ACCESSIBLE IN OFFICE

Many of my favourite tools in Microsoft Office are now buried deep in the Ribbon – and some don't appear at all. How can I make these easier to get at?
John Lowe

There are several customisation tools built in to Microsoft Office – in this step-by-step guide we'll reveal how to locate these tools and how to make them accessible via the Quick Access toolbar with just one or two clicks.

The simplest way to make tools more accessible is to add them to the Quick Access toolbar, which appears above the Ribbon. Any command in the Ribbon can be added – just right-click one and choose 'Add to Quick Access toolbar'.

Click the drop-down arrow next to the Quick Access toolbar and choose 'More Commands...'. From here you can add any Office command to the toolbar: click the Popular Commands drop-down menu to list commands not in the Ribbon.

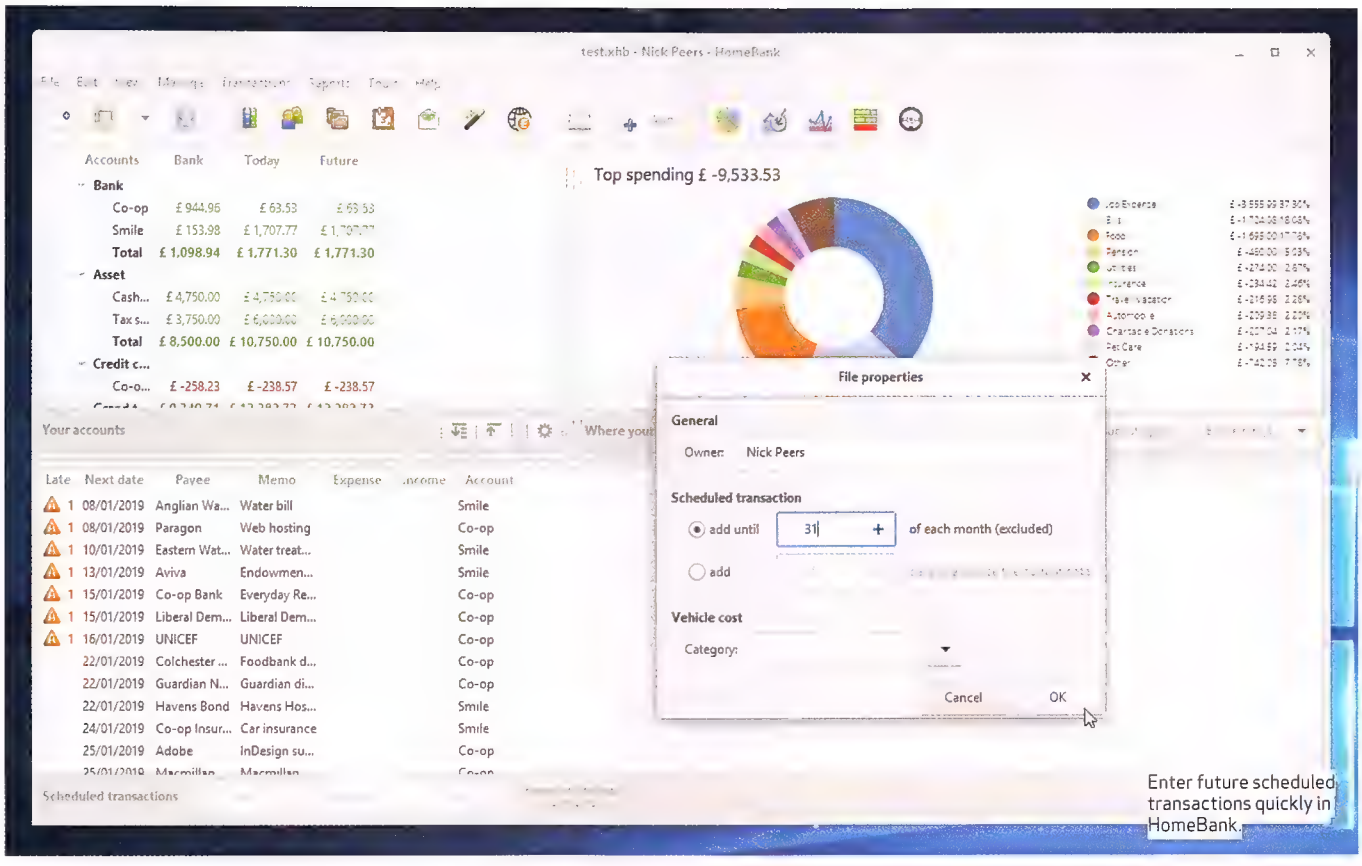
You can remove selected items from here, or change their running order using the up/down keys to the right. Click Import/Export > 'Export all Customisations' to back up your customised toolbar, then click OK when you're finished.

By default, the toolbar sits above the Ribbon – if this starts to get cramped with all your added items, click the drop-down arrow next to it and choose 'Show below the ribbon' to move it down where it should have more space to breathe.
Matt Hanson

SOFTWARE

ENTER MULTIPLE TRANSACTIONS AT ONCE

I recently switched to the free personal finance tool HomeBank. I like to input all my scheduled transactions at the



beginning of the month so I can see how much spare money I'll be left with after all my regular bills are paid. How can I do this without having to manually enter them one at a time?
Carl Young

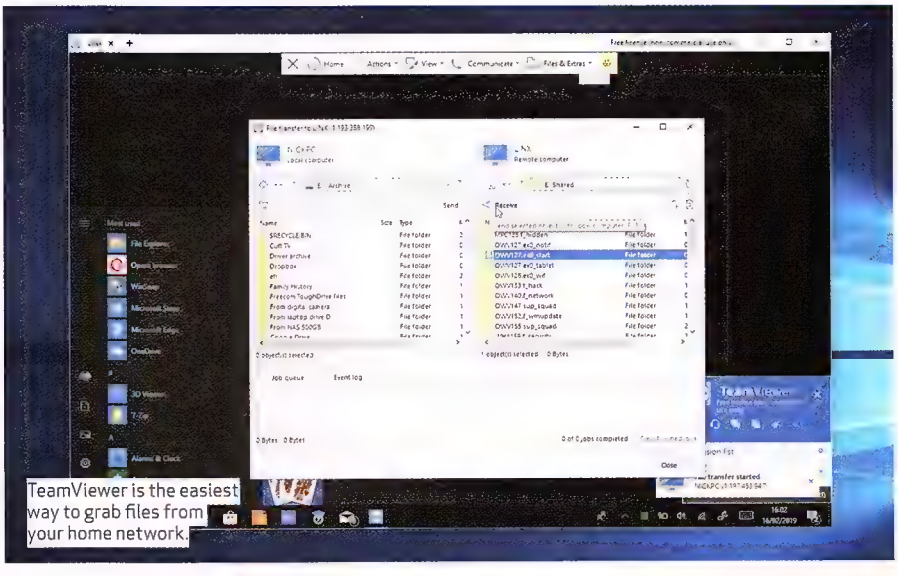
HomeBank has a built-in scheduler tool that you can use to do just that. Select Transactions › 'Set scheduler…'. The default setting enables you to automatically enter all scheduled transactions up to five days in advance – you can alter this figure from 1 to any number of days you like (typically 30 or 31).

If you're going to religiously enter these transactions on a specific day of each month, choose 'add until' and set the date to the day before the current one, so all transactions for the following month will be added. Click 'OK' to save your settings, then select Transactions › Post Scheduled to enter them all automatically in one go.
Rob Mead-Green

NETWORKING
ACCESS NETWORK WHILE ON THE ROAD

I'm going travelling and would like to be able to gain access to my home PC without opening it up to the wider Internet. Do you have any suggestions?
George Parris

A lot depends on what you need – if you're simply looking to connect to an individual PC, then your best bet would be to explore an option like TeamViewer (**www.teamviewer.com**), which will enable you to connect to your home PC from a laptop or mobile for remote-control purposes or to simply transfer files to and from it. If you need access to multiple network resources, then a VPN server setup might be better. This is a technically tricky route to follow, though: you'll need a high-end router or a more powerful network drive, such as one from QNAP or Synology, plus you'll need to sign up for a dynamic DNS address to simplify the connection process – you can get a free address from **www.noip.com**. When configuring your VPN server, Windows has built-in support for all protocols except OpenVPN – L2TP/IPSec (PSK) is the best alternative. If you do go down the OpenVPN route, you'll need to download and install the OpenVPN client from **https://openvpn.net** on your laptop to connect to the network at home. In George's case, however, TeamViewer is by far the best option.
Catherine Ellis

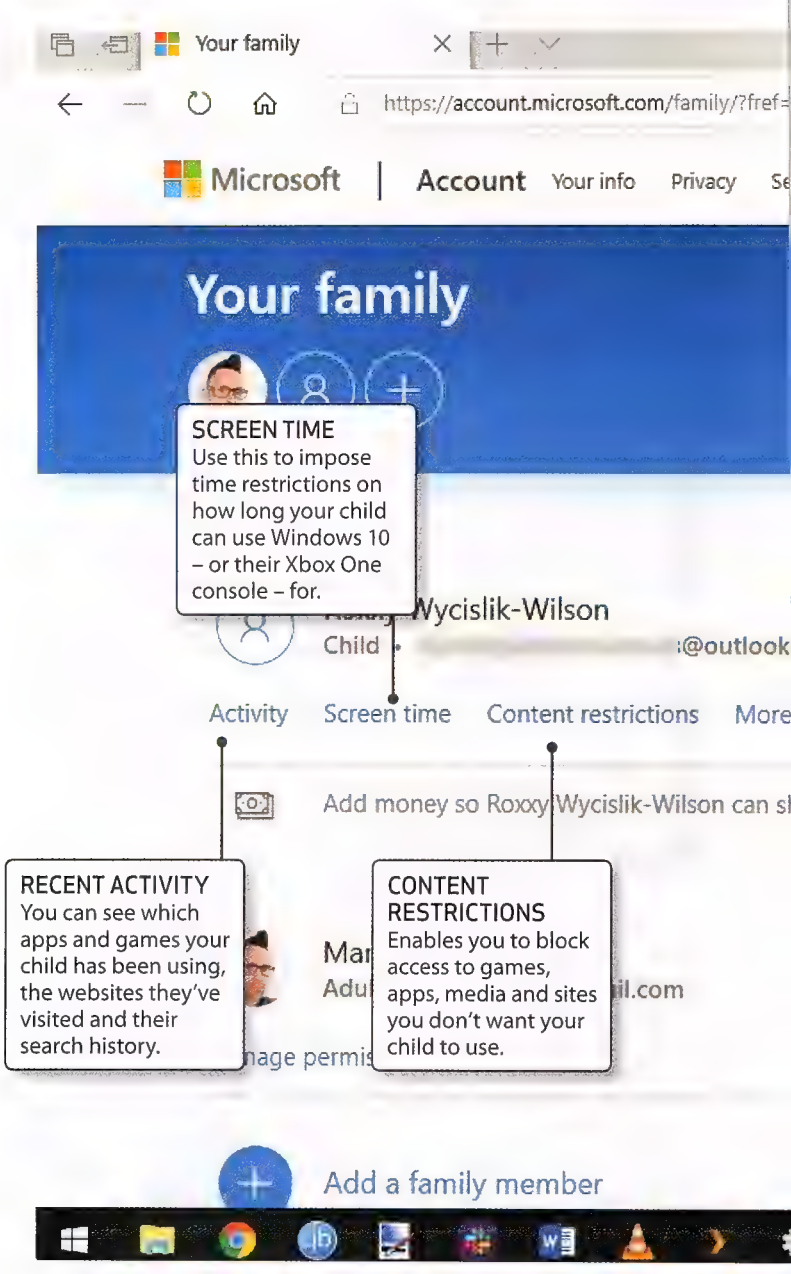


Child-proof Windows 10

Mark Wycislik-Wilson shows how to keep tabs on what your children are up to on your PC with parental controls in Windows 10.

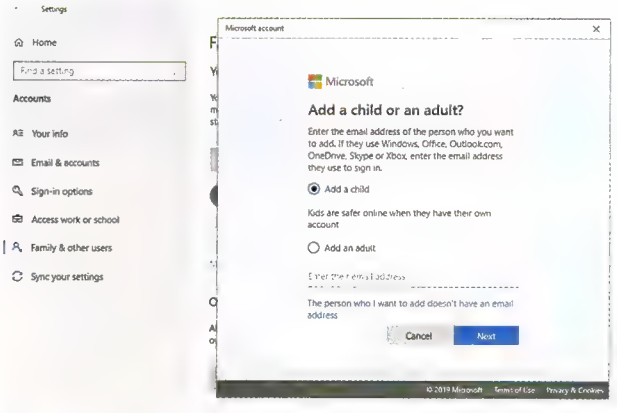
Being a parent is stressful and time-consuming enough without having to worry about either what your child is using their (or your) PC for, or for how long. To save you from having to constantly monitor their use in person, Windows 10 includes a powerful collection of parental control options, which can act as your eyes and ears when you are busy with other things.

Using built-in parental controls, it is possible to place restrictions on the websites that can be visited, the apps that can be run, and when the PC can be used. While you might expect the options to be configured in Settings, you'll need to visit your Microsoft account online, and from there manage all the user accounts you have set up on your PC and added to your family. This enables you to control settings from any Internet-connected device, and monitor your child's PC use remotely.


Your family
https://account.microsoft.com/family/?fref=
Microsoft | Account Your info Privacy
Your family
SCREEN TIME
Use this to impose time restrictions on how long your child can use Windows 10 – or their Xbox One console – for.
Child
Activity
Screen time
Content restrictions
RECENT ACTIVITY
You can see which apps and games your child has been using, the websites they've visited and their search history.
CONTENT RESTRICTIONS
Enables you to block access to games, apps, media and sites you don't want your child to use.
Add a family member

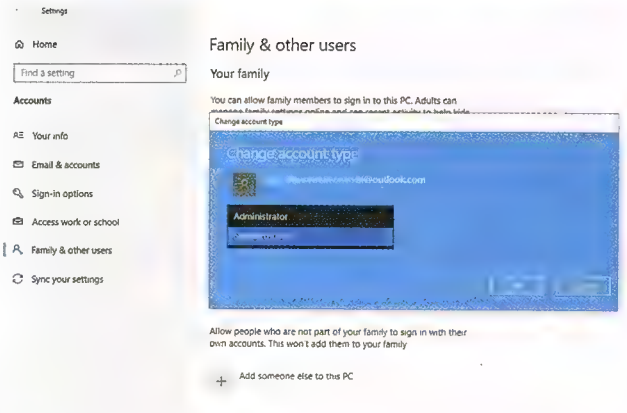
Step by step

Master parental controls



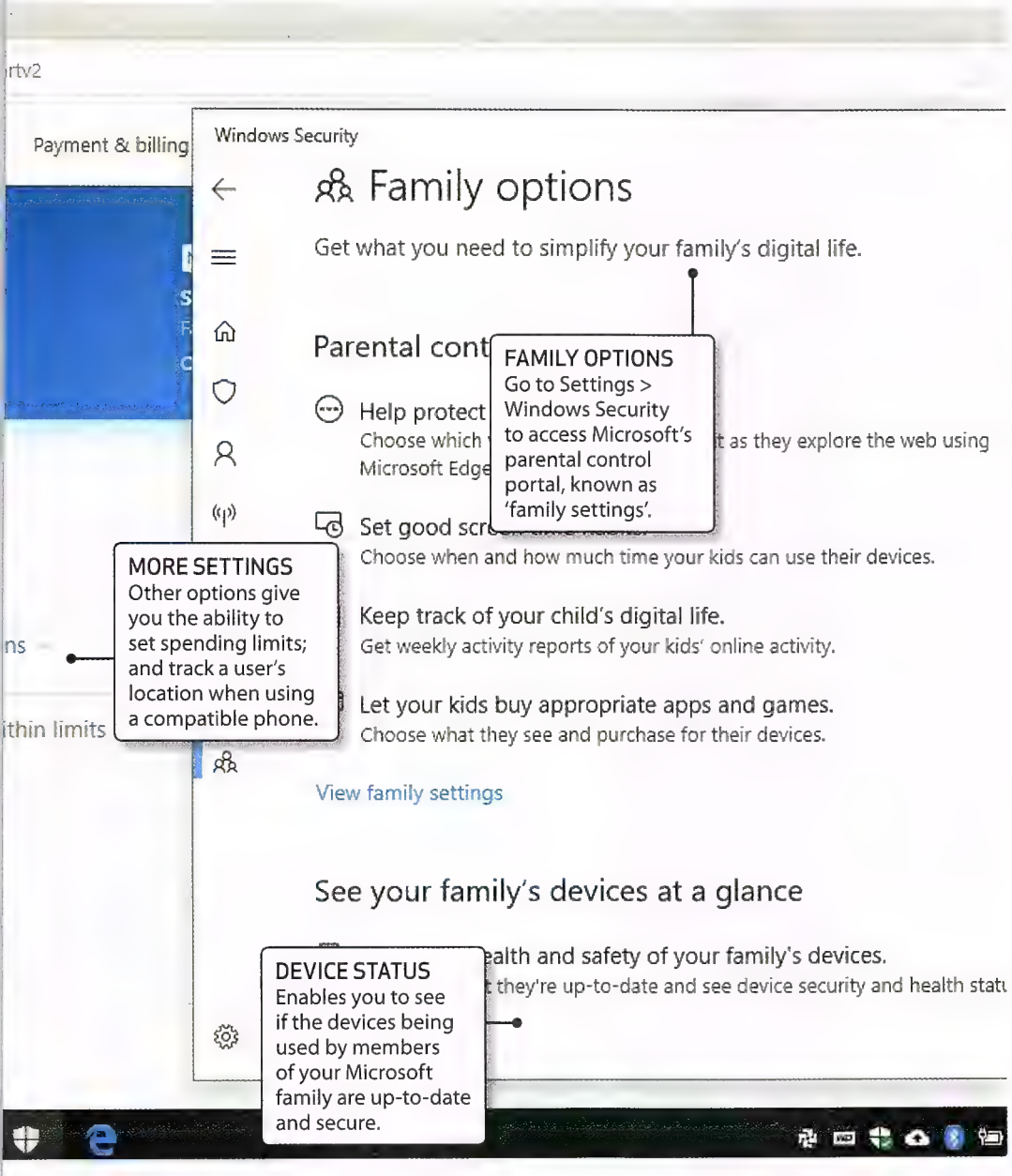
1 SETTING UP CHILD ACCOUNTS

To take parental control of a child's account, it first needs to be configured correctly. To do that, go to Start > Settings > Accounts > 'Family & other users'. Click 'Add a family member' and create as many accounts as you need for the members of your family – just follow the on-screen instructions, indicating that you would like to create an account for a child.



2 ENSURE ACCOUNTS ARE LIMITED

If you're setting up a child account from scratch, it will be as a Standard User, so the account can't be used to make potentially damaging changes to Windows. If you're using an existing account, check its status. In the 'Family & other users' window ensure none of the accounts are set as Administrators. If any are, click them, then 'Change account type' and select Standard User.

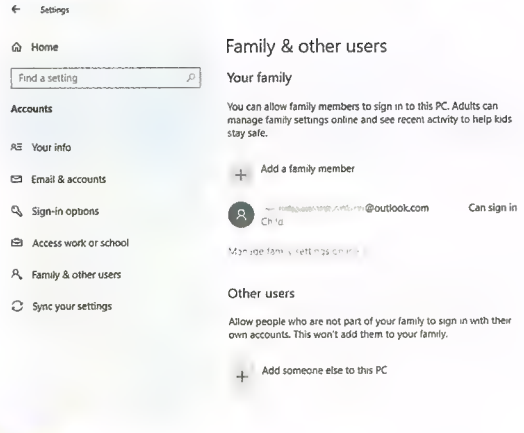

Payment & billing
Windows Security
Family options
Get what you need to simplify your family's digital life.
Parental cont
Help protect
Choose which
Microsoft Edge
as they explore the web using
Set good scr
Choose when and how much time your kids can use their devices.
Keep track of your child's digital life.
Get weekly activity reports of your kids' online activity.
Let your kids buy appropriate apps and games.
Choose what they see and purchase for their devices.
View family settings
See your family's devices at a glance
ealth and safety of your family's devices.
they're up-to-date and see device security and health stat
FAMILY OPTIONS
Go to Settings > Windows Security to access Microsoft's parental control portal, known as 'family settings'.
MORE SETTINGS
Other options give you the ability to set spending limits; and track a user's location when using a compatible phone.
DEVICE STATUS
Enables you to see if the devices being used by members of your Microsoft family are up-to-date and secure.

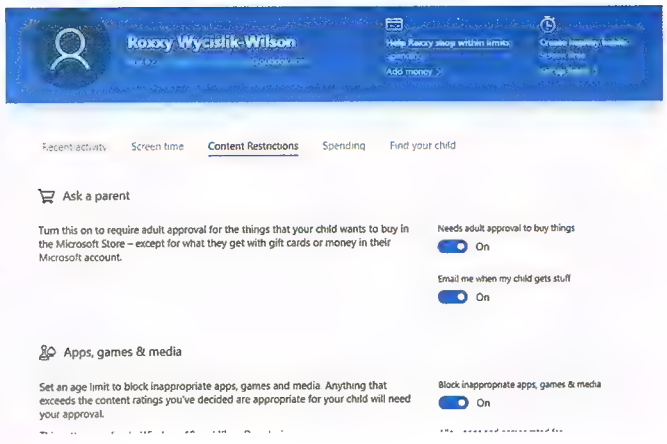
Jargon buster

PARENTAL CONTROLS
Restrictions and monitoring options that limit what a child can do on a PC. This can include blocking access to websites, and age-limiting games.

MICROSOFT FAMILY
Microsoft knows families use their PCs both together and separately. Individual user accounts can be linked into a 'family' so you can not only do things like set up a shared calendar, but place restrictions on users as well.

MICROSOFT ACCOUNT
An online account that enables you to synchronise settings and personal data across different devices, and manage parental controls.


Settings
Home
Find a setting
Accounts
Your info
Email & accounts
Sign-in options
Access work or school
Family & other users
Sync your settings
Family & other users
Your family
You can allow family members to sign in to this PC. Adults can manage family settings online and see recent activity to help kids stay safe.
Add a family member
Can sign in
Other users
Allow people who are not part of your family to sign in with their own accounts. This won't add them to your family.
Add someone else to this PC

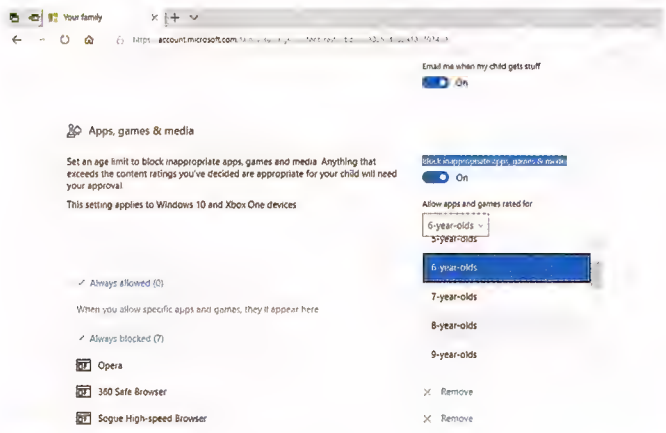

Roxxy Wycislik-Wilson
Add money
Recent activity
Screen time
Content Restrictions
Spending
Find your child
Ask a parent
Turn this on to require adult approval for the things that your child wants to buy in the Microsoft Store – except for what they get with gift cards or money in their Microsoft account.
Needs adult approval to buy things
On
Email me when my child gets stuff
On
Apps, games & media
Set an age limit to block inappropriate apps, games and media. Anything that exceeds the content ratings you've decided are appropriate for your child will need your approval.
Block inappropriate apps, games & media
On

1 ADJUSTING FAMILY SETTINGS

While we refer to 'parental controls', Microsoft prefers to use the phrase 'family settings'. Any restrictions you wish to place on the user accounts you have created need to be put in place through the Family section of your Microsoft account. To access this, just click the 'Manage family settings online' link on the 'Family & other users' page of Settings.

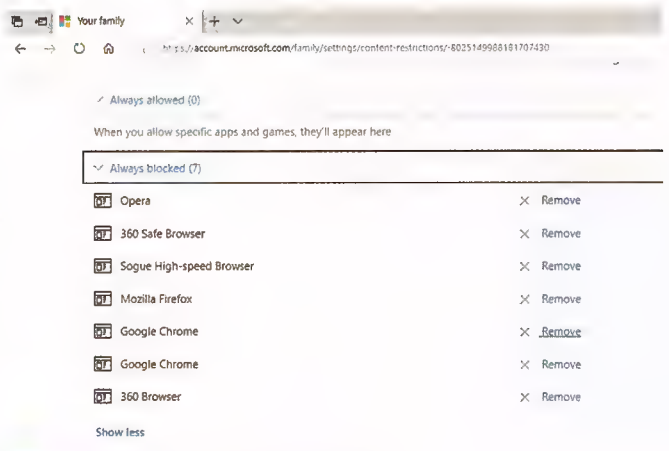
2 IMPLEMENTING BUYING RESTRICTIONS

When you visit the 'Your family' section, you should see a list of any accounts you've created. Beneath the name of the account you want to impose parental controls on, click 'Content restrictions'. You can start by using the first two switches to prevent a child buying things through their account without permission, and to send out emails when purchases are made.


Your family
Email me when my child gets stuff
On
Apps, games & media
Set an age limit to block inappropriate apps, games and media. Anything that exceeds the content ratings you've decided are appropriate for your child will need your approval.
This setting applies to Windows 10 and Xbox One devices
Block inappropriate apps, games & media
On
Allow apps and games rated for
6-year-olds
6-year-olds
7-year-olds
8-year-olds
9-year-olds
Always allowed (0)
When you allow specific apps and games, they'll appear here
Always blocked (7)
Opera
360 Safe Browser
Sogue High-speed Browser
Remove
Remove

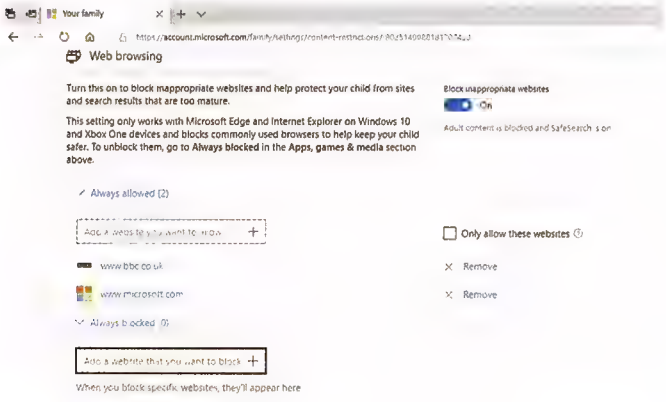
5 SOFTWARE RESTRICTIONS

Scroll down the page slightly to the 'Apps, games & media' section and ensure the 'Block inappropriate apps, games & media' setting is enabled. Use the drop-down menu to choose the age rating you are happy for your child to use. Bear in mind that ratings are somewhat subjective, and you may not necessarily agree that a particular title is suitable for your child.



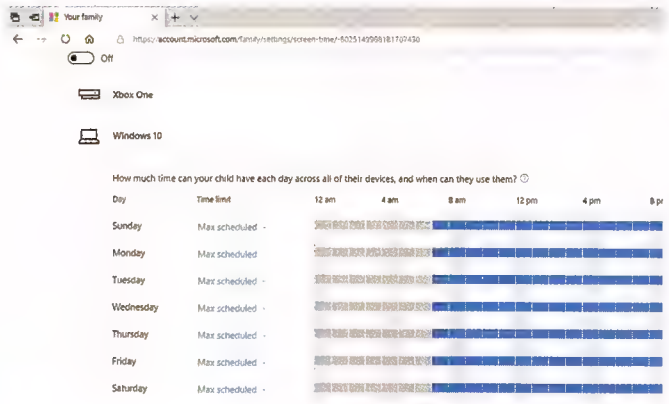
6 CUSTOMISE APP RESTRICTIONS

It may be that an app you feel is suitable for your child is blocked by an age restriction – but raising the limit may not be appropriate. For example, Microsoft blocks some web browsers because they don't offer the same control options as Edge, but you can lift these restrictions. In the 'Always blocked' list, click Remove next to any app you're happy for your child to use.


Your family
Web browsing
Turn this on to block inappropriate websites and help protect your child from sites and search results that are too mature.
This setting only works with Microsoft Edge and Internet Explorer on Windows 10 and Xbox One devices and blocks commonly used browsers to help keep your child safer. To unblock them, go to Always blocked in the Apps, games & media section above.
Block inappropriate websites
On
Always allowed (2)
Only allow these websites
www.bbc.co.uk
www.microsoft.com
Remove
Remove
Always blocked (0)
When you block specific websites, they'll appear here

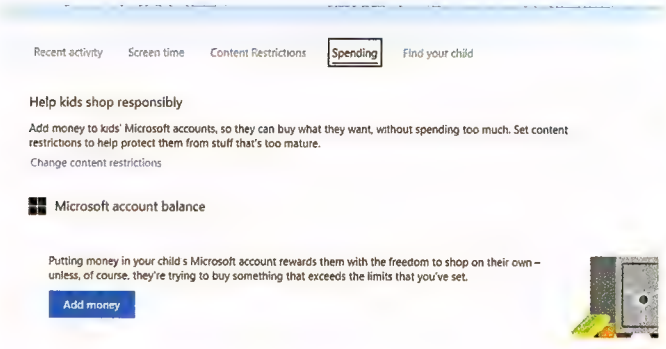
7 RESTRICT WEB BROWSING

Letting your child have unfettered access to the web can be scary – but you can put limits in place. If there is a site you'd like to stop your child from visiting, enter its URL in the 'Always blocked' section and click '+'. To ensure the sites you approve of can be accessed, enter their URLs in the 'Always allowed' section. Tick the 'Only allow these websites' box to limit web access further.



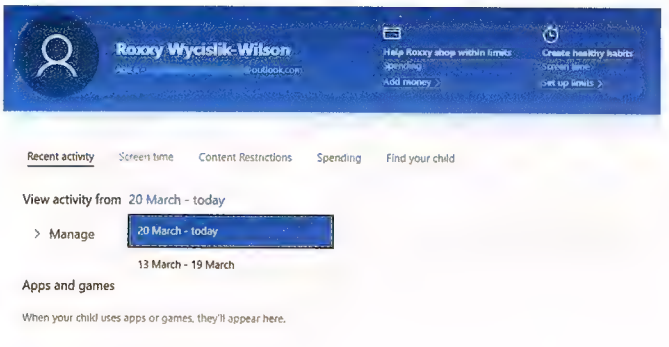
8 LIMIT COMPUTING TIME

You can place a time limit on how long your child is able to use the computer for by scrolling to the top of the page and clicking the 'Screen time' heading. Flick the toggle switches to the On position for any computer or console listed that you would like to place limits on, and then use the timetable that appears to indicate when screen time should be permitted.


Recent activity
Screen time
Content Restrictions
Spending
Find your child
Help kids shop responsibly
Add money to kids' Microsoft accounts, so they can buy what they want, without spending too much. Set content restrictions to help protect them from stuff that's too mature.
Change content restrictions
Microsoft account balance
Putting money in your child s Microsoft account rewards them with the freedom to shop on their own – unless, of course, they're trying to buy something that exceeds the limits that you've set.
Add money

9 LIMIT SPENDING

In Step 4, we mentioned how it is possible to require parental approval before any purchases can be made, but there are more money-related options in the Spending section. Here you can add some money to your child's account balance so they can shop online without having to pester you for money at the time of purchase, and without the risk of spending too much.



10 MONITOR ACTIVITY

As well as placing restrictions on your child, you can also monitor what they do online and on your PC. Head to 'Recent activity' and you will be able to see not only which apps and games they've used, but also the sites they have visited and the searches they've conducted. There are shortcuts to impose restrictions if you see anything that you feel requires action.

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What to do after Microsoft ceases support
How to make your PC childproof
Create a safe space online for your kids
FUTURE
Browse better
KEEP YOUR ONLINE LIFE PRIVATE
Thunderbolt or USB?
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Stream PC games and more to your Xbox One

Xbox has toyed with a Wireless Display app on and off for years, but at long last, it's finally available to the general public. Fraser Brown explains how to use the feature to stream (almost) anything you want from your Windows PC to an Xbox One console.

The good news is that streaming Steam titles to your Xbox is easy. The bad news is that you need an unbelievably high-quality connection for a playable experience – but if you've ever used Miracast before, that should not come as a big surprise.

THE SETUP

First things first: In order to stream Steam games to an Xbox One, you'll need a gaming PC with Steam installed, an Xbox One, and a router (try to contain your shock). Both the Xbox One and the PC will need to be connected to the same network. You can do it either wired or wirelessly, but in our testing, a wireless connection will not be nearly strong enough for a smooth gaming experience.

The gaming PC will also have to have Windows 10 installed and Miracast functionality built in. Miracast compatibility is dependent on a lot of hardware and software specifications, so it's hard to guarantee that a given system will have it. But here's a good litmus test: If your PC came with Windows 8 or 10 installed, it probably has Miracast. If your PC came with Windows 7 installed and has subsequently been updated to Windows 10, it may not.

You will also need the Wireless Display App on your Xbox console. You can follow the link and install it remotely, or use the console to find it in the Xbox One app store. If you have an older version of the app from a beta build, be sure to update to the latest version.

STREAMING STEAM GAMES

At this point, you have to jump through a few small hoops, but the process is pretty foolproof. First, open the Wireless Display App on Xbox. You won't need to do anything else with the console until you're ready to play.

Next, on your PC, press the Windows key and the P key simultaneously. This will activate the Projection menu. Click 'Connect to a Wireless Display'. Your Xbox One will pop up as an option. Click it, and you're just about done.

(Bear in mind that Windows might treat your TV screen as an additional display instead of a duplicate. If that happens, just press Win-P again and change the display type. We recommend Duplicate, but you can also try Second Screen Only.)

The last thing is to allow the Xbox to use its controller as an input. To do this, just click on the Action Center in the lower-right corner of your Windows screen, next to the clock. You'll have a notification prompting you to approve the Xbox inputs; all you have to do is click it once.

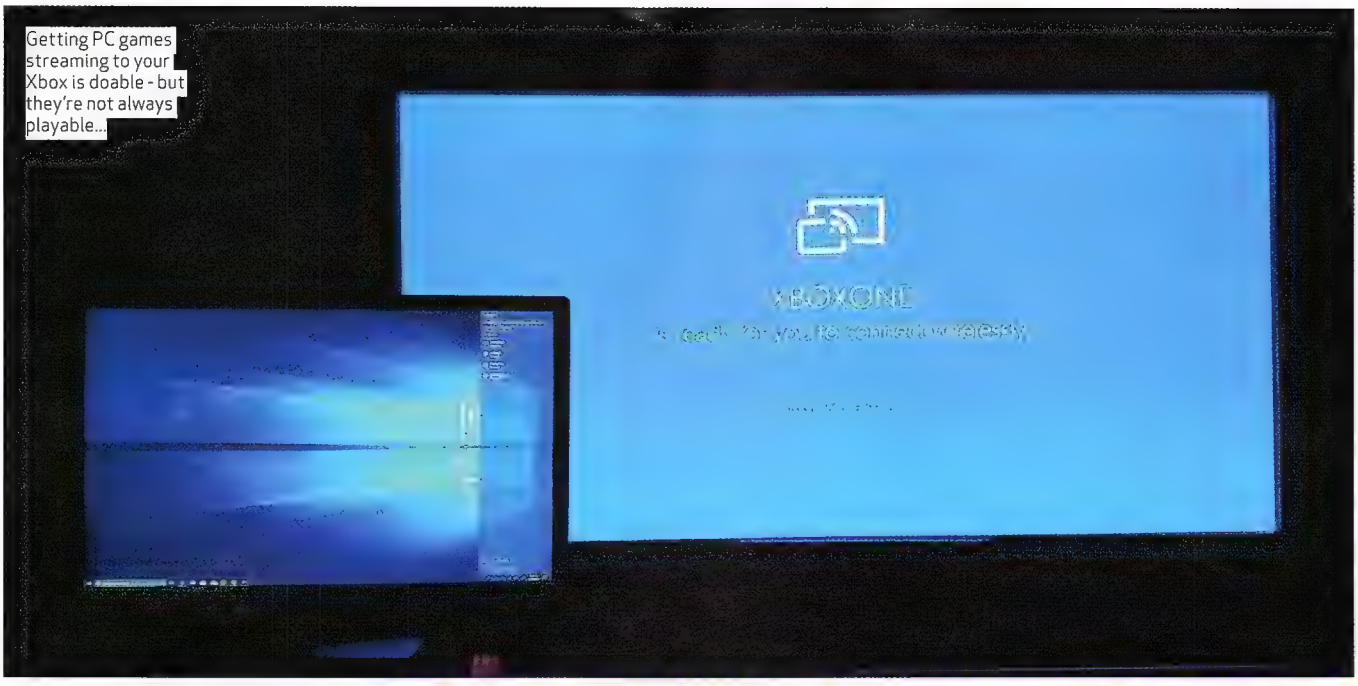
However, Windows will not automatically select the best resolution for your TV. Consequently, you'll also need to access the Display menu (right click on your Windows desktop), then set the resolution manually. 1,920 x 1,080 (aka 1080p) is always a safe bet, but depending on your computer and TV, you may be able to go up to 3,840 x 2,160, aka 4K.

THE BIG PICTURE

Now that your Xbox and PC are linked, there's really no special trick to using Steam – or any other program. Just open it up and use your controller to navigate. Unfortunately, mouse-and-keyboard support isn't available through the Wireless Display app just yet, meaning that you'll have to restrict yourself to games that are compatible with gamepads.

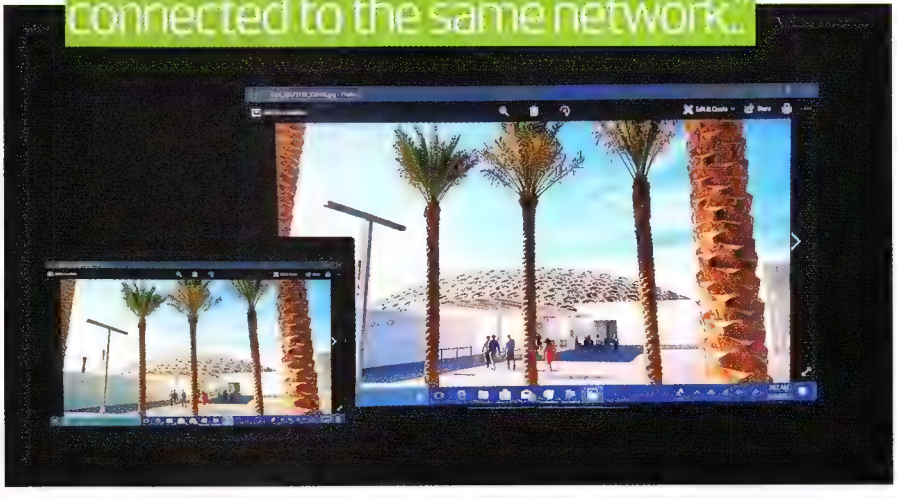
We do have a recommendation, though: On your computer, turn on Steam's Big Picture Mode – it's in the View menu. In case you've never tried it before, Big Picture optimises Steam for a controller-based living room setup. This will allow you to not only play games, but also to work with a sort of miniature operating system. It can save you quite a bit of time if your Xbox and PC are in different rooms

Of course, to disengage the link, you can shut the Wireless Display app on your Xbox, or sever the link via the projection menu in Windows.



Getting PC games streaming to your Xbox is doable - but they're not always playable...

"In order to stream Steam games to an Xbox One, you'll need a gaming PC with Steam installed, an Xbox One, and a router. Both the Xbox One and the PC will need to be connected to the same network."



HOW WELL DOES IT WORK?

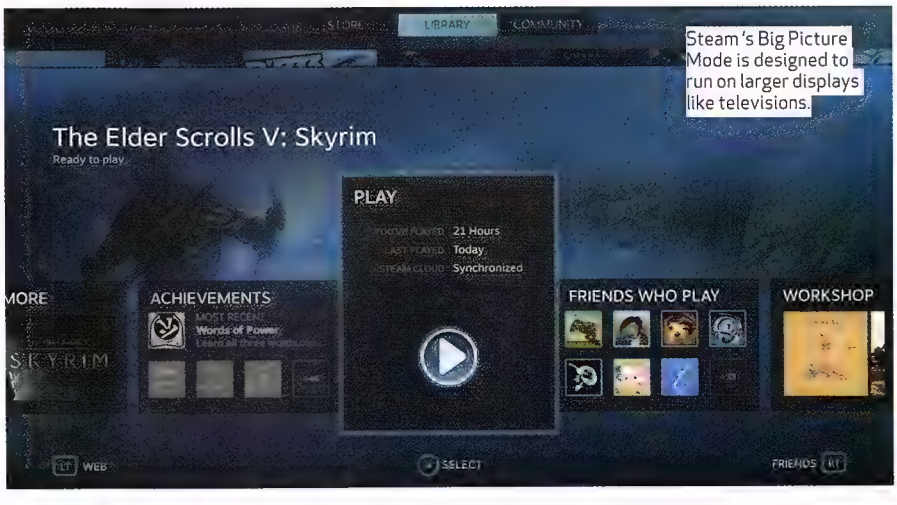
As discussed above, you can stream Steam games to your Xbox – but you might not necessarily want to. During our own tests, even on a strong wireless network, I encountered a lot of lag, imprecision and inconsistency.

The worst part was not the video, which frequently paused to buffer – it was actually the audio, which vacillated between "almost inaudible" and "uncomfortably loud." It would cut out, play for a few muffled seconds, then come through loud and clear, then restart the process every few seconds or so.

Playing a single-player title under these conditions would be unpleasant enough; trying to compete in a multiplayer title would be almost unthinkable.

The app always has the potential to improve, of course, but for those of you who have never used Miracast before, this is pretty much how it works, even at the best of times. It's convenient for broadcasting a few images onto a big screen, but it's never been all that good at streaming video and audio with perfect fidelity. And you really, really need solid video and audio for Steam.

By all means, give it a try, but don't be surprised if you find yourself falling back on Xbox games before too long.



Steam's Big Picture Mode is designed to run on larger displays like televisions.

Play guitar in GarageBand

Carrie Marshall shows you how to turn your guitar up to 11 in any style you like. No ability required!

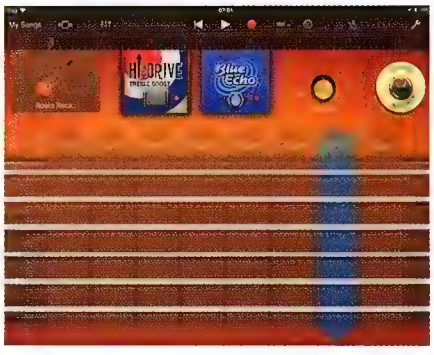
If you've always dreamed of being a guitar hero but couldn't be bothered with the tedium and sore fingers of actually practising, Apple's own GarageBand is here to help.

Apple's app enables you to play guitar even if you can't play it for real, and the results can be really impressive: not only does GarageBand create the chords for you, but it can even do the actual playing.

You can use a classic acoustic guitar, or choose from three electric offerings. Classic Clean emulates the warmth of big-bodied electrics, Roots Rock is bluesy, and Hard Rock adds some fun distortion. Each electric guitar also includes a pair of effects pedals to colour the sound. For example, Classic Clean has an echo and a chorus pedal, while Hard Rock has an overdrive and a flanger. You can't tweak the pedals' parameters – you need to go for a professional instrument app for that kind of fine-tuning – but they expand the range of available sounds to keep things interesting.

CHOOSE A STYLE

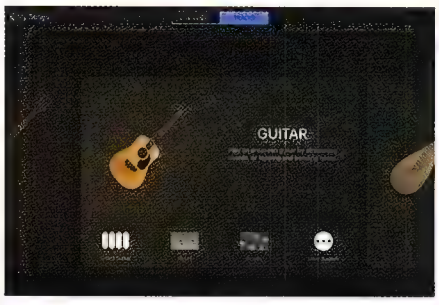
There are three ways to play guitar in GarageBand. The first is to play like you would on a real guitar, doing the fretting and picking or strumming yourself. The second is to let GarageBand make the chords while you strum or pick. And the third is to let GarageBand do everything while you tell it what chords to play. In this tutorial, you'll explore all three, and you'll also discover the cool features for more advanced guitar players.



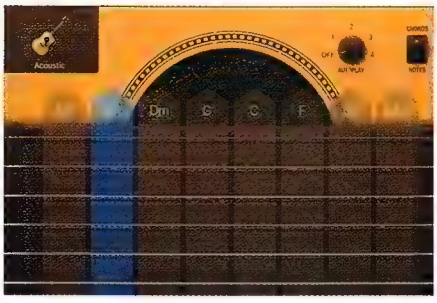
The electric guitars have effects pedals at the top of the screen, which you can use to change their sounds.

"The results can be really impressive: not only does GarageBand create the chords for you, but it can even do the actual playing."

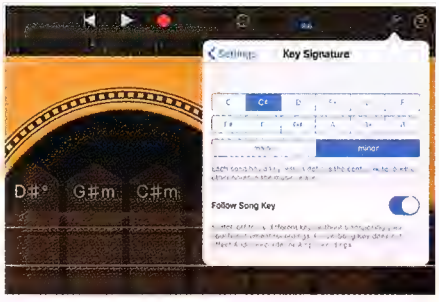
How to get guitaring in GarageBand



1 GET A GUITAR
Create or open a song and tap on the instruments icon in the top-left corner. Swipe until you see Guitar. The easiest way to start playing is to choose Smart Guitar, so let's do just that by tapping on the appropriate icon.



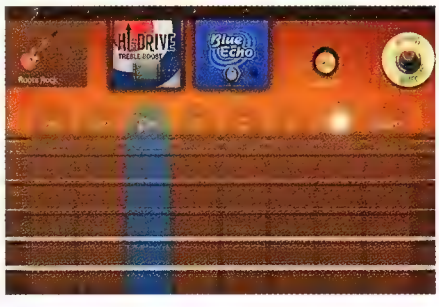
2 START STRUMMING
Smart Guitar is fun. Tap a string and it'll play the appropriate note; tap the name of the chord above the strings and GarageBand will play the whole chord. You can also strum by swiping up or down on the strings.



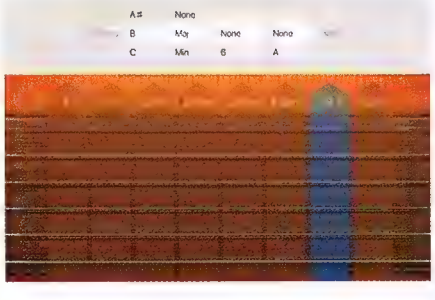
3 CHANGE THE KEY
Fancy a different key? Tap the settings icon (the spanner) and then choose Key Signature. You can now choose the root note and whether it's a minor or major key. The guitar chords change accordingly.

4 PLAY SOME NOTES
If you'd rather play your own notes or chords, tap on the Chords/Notes switch towards the top right. This turns off the Smart Guitar chords mode and lets you play notes as you would on a real guitar's fretboard.

5 LET YOUR IPAD PLAY
Turn the AutoPlay knob and GarageBand will actually play the guitar part for you. There are four rhythms to choose from, and you can move from chord to chord simply by tapping the ones you want.



6 CHANGE YOUR GUITAR
If you want something a bit more rock, tap on the image of the acoustic guitar to see the other available instruments. Here we've gone for Roots Rock, a gently distorted, bluesy Les Paul guitar.



7 CHANGE THE CHORDS
You're not limited to the standard chords: you can create your own by tapping Settings and then Edit Chords. Tap the chord you want to replace and then swipe through the dials to get the chord you want.

8 SET THE SCALE
GarageBand can help with guitar scales too. Tap on the Scales tab just above the guitar fretboard and you can change the scale to anything you like. Guides appear on the frets to help you navigate the notes.

9 GET WIGGLY WITH IT
You can add expression by bending the strings, either gently or in the full-on hair-metal solo style we've gone for here. It's not as screamy as the real thing would be, but it sounds pretty good when using the Hard Rock guitar.

Work faster with Finder

The Mac's file manager is packed with ways to help you work quicker. Alan Stonebridge shows you how.

Does it feel disproportionately onerous to get things done in Finder? Features like Spotlight can help to a degree, but what can you do in scenarios where it's unavailable or irrelevant? That's why you can tailor Finder and make use of some of its less obvious features to speed up working with your files.

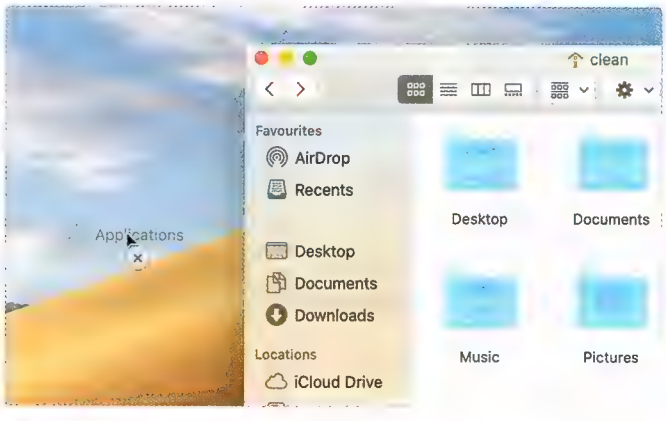
The items in Finder's sidebar, for example, aren't set in stone. If you don't need a shortcut to the Applications folder there – Spotlight and Launchpad may be good enough for you – why keep it around? You can pick Go > Applications to see that folder's full contents instead.

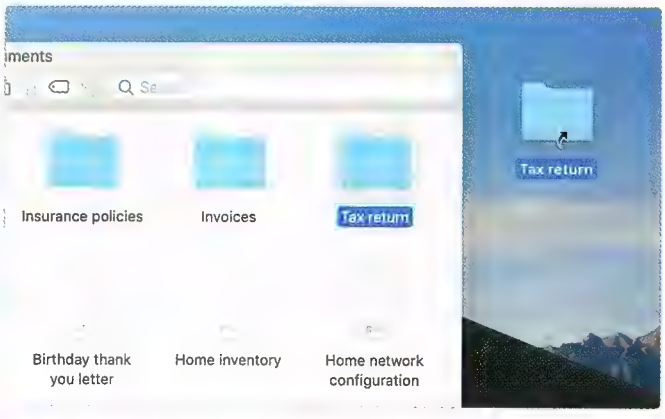
What if you're not fussed about filing in folders? Tags can help you find things later. You can add them when you first save a file, by moving the pointer over an open file's title and clicking the arrow it reveals, or later in Finder.

Let's say you need to send a bunch of files to someone, but renaming each file in turn is slow and tedious. With a naming scheme in mind, all of them can be changed in seconds. Read on to find out more.

> "If you don't need a shortcut to the Applications folder there – Spotlight and Launchpad may be good enough for you – why keep it around?"

How to save time in Finder



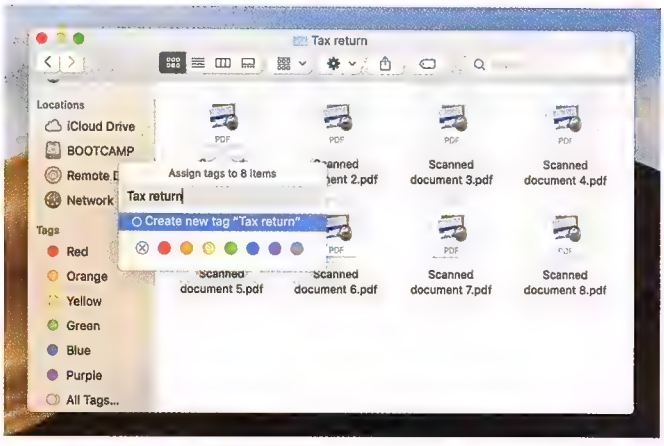


1 TIDY UP THE SIDEBAR

You can drag unwanted default items out of the bar to remove them – wait for a cross to appear, then let go – and folders you want into the Favourites section. Recent macOS versions let you drag sections into the order you want.

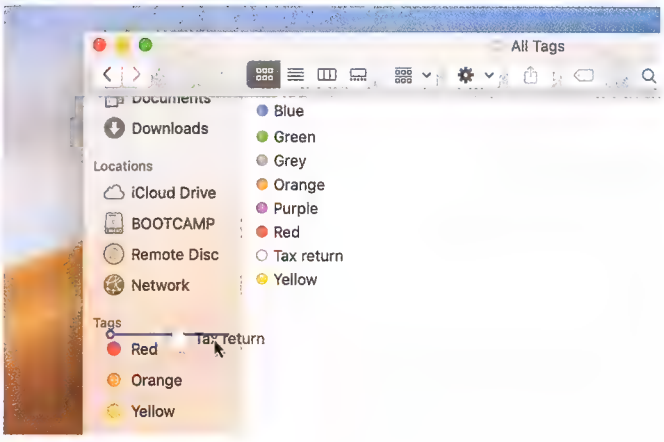
2 MAKE SHORTCUTS ELSEWHERE

Aliases are another way to reach files and folders deep on your Mac that you don't want in Finder's sidebar or in the Dock's right side. Drag one, hold option-command and drop elsewhere – the desktop, say – to create a link to the original.



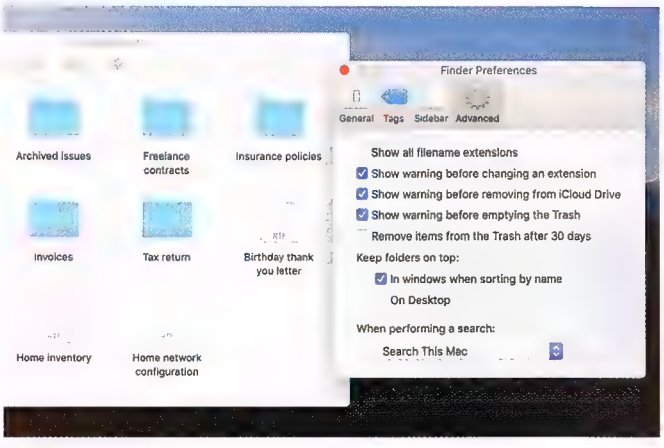
3 TAG YOUR FILES

Tags also help when you need to quickly look up files. control-click a file (or a selection) and choose a tag from the menu (which you can set in Finder > Preferences > Tags), or choose Tags to pick another or create a new one.



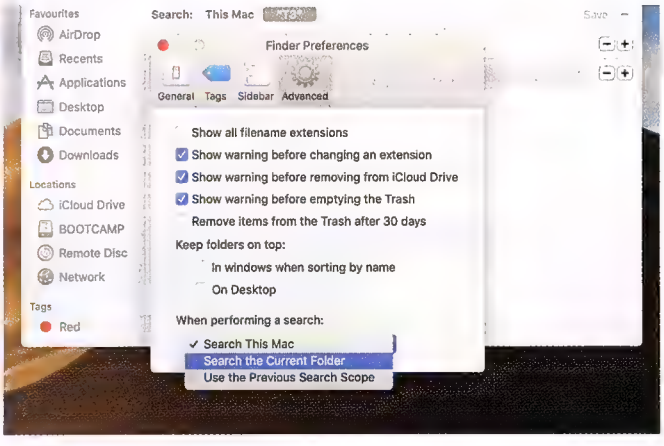
4 FIND ITEMS BY TAG

Start typing a tag name in Finder's search bar and choose it from the suggestions to see all items tagged as such. To add a tag to the sidebar for instant access, click Show All there, then drag a tag from the list to that section.



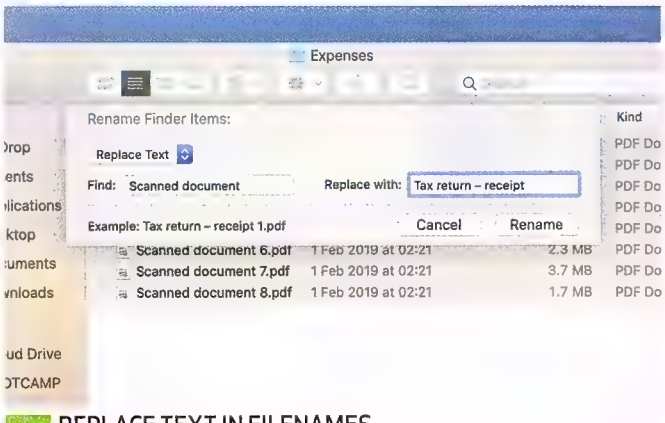
5 BRING FOLDERS TO THE TOP

If you're methodical about filing in folders and, despite other shortcuts, often dig several levels deep, go to Finder > Prefs > Advanced. For 'Keep folders on top', tick 'In windows when sorting by name' to more rapidly drill down.



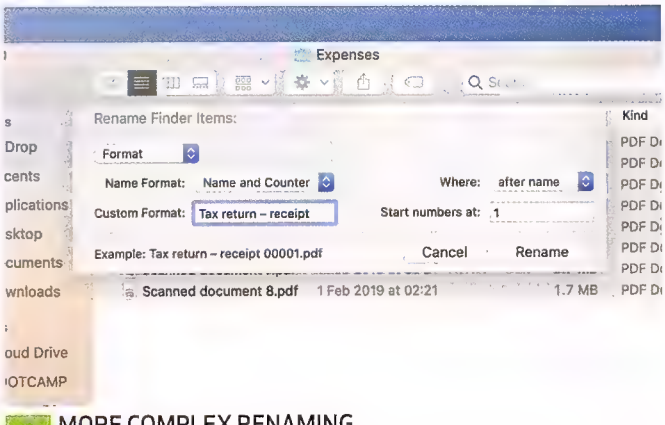
6 SPEED UP SEARCHING

When you type in Finder's search bar, by default it shows files from all across your Mac. Often click the name of the folder just viewed in the search options bar? You can make that the default scope in Finder > Prefs > Advanced.


Expenses
Rename Finder Items:
Replace Text
Find: Scanned document
Replace with: Tax return – receipt
Example: Tax return – receipt 1.pdf
Cancel
Rename
Kind
Scanned document 6.pdf 1 Feb 2019 at 02:21 2.3 MB
Scanned document 7.pdf 1 Feb 2019 at 02:21 3.7 MB
Scanned document 8.pdf 1 Feb 2019 at 02:21 1.7 MB

7 REPLACE TEXT IN FILENAMES

Select multiple files, then control-click one and choose the Rename command. You can pick from three renaming schemes. Replace alters only names containing what you specify. The second box can be left blank to remove text.



8 MORE COMPLEX RENAMING

Add Text can prefix or suffix all names with a phrase you set. Format gives the files the same base name, prefixed or suffixed with a number, counter (with leading zeros) or date and time (in 'DD-MM-YYY at hh.mm.ss' format).

How to build a photo library in Shotwell

Nick Peers reveals how to bring order to your chaotic photo and video library with Ubuntu's default photo organiser.

Digital photography has been become both a blessing and a curse. It's almost inconceivable to remember the time when every photo was precious, eagerly awaited with a mixture of anticipation and dread. Nowadays, digital clutters up your hard drive with dozens – if not hundreds – of photos for every major life event, never mind the rest.

Thankfully, there's a tool that can help bring order to your chaotic collection. Shotwell doesn't simply bring your photos into a single library: you can use it to organise them a myriad of different ways, from date-based events to keyword tags. It even offers a selection of handy image-editing tools to help lift lacklustre photos through creative use of colour and light correction, cropping, straightening and even removal of the dreaded red-eye.

Shotwell is included by default with both Ubuntu and Mint, but it's an old version (0.28.4). Step one, therefore, is to ensure you're running the latest version – 0.30.1 at time of writing. Open a Terminal window and issue the following commands:

```
$ sudo add-apt-repository ppa:yg-jensge/shotwell
$ sudo apt-get update
$ sudo apt-get install shotwell
```

Close the Terminal window and launch Shotwell from the applications list. It will immediately search your Pictures folder for images and videos, which appear as a list of thumbnails organised by the file's date- and timestamp, newest first. You'll see several options for filtering photos and videos by type at the top of the screen, plus a search box to quickly look for photos using keywords, which will become more useful as you organise your photos.

Double-click an item to either view it in Shotwell's built-in picture viewer or – if it's a video – in your default movie player. When viewing photos, use your mouse's scroll wheel or the magnification slider to zoom in and out, and click and drag to move around the photo. Double-click again to return to the main view.

View and edit photos in Shotwell

1 FILTER PHOTOS
Use the options in the left-hand pane to filter the list of photos in various ways, including by event, tag or flag.

2 BASIC INFORMATION
When you select a photo to view, its basic file information is displayed here.

3 CROP TOOL
The crop tool enables you to cut out superfluous detail: click and drag on the crop square to resize or move it.

4 CROP OPTIONS
Click to select the aspect ratio of your selection, or switch between portrait and landscape orientation using these tools.

5 TOOLBAR
Context-sensitive options appear here – when you're viewing a file, various editing tools plus the zoom slider are displayed.

6 EXTENDED INFORMATION
Press Ctrl-Shift-X to display additional information not shown by the Basic information tool.

IMPORTING PHOTOS AND VIDEOS

These days, it's not uncommon for people to have a different folder than the standard Pictures in which to store photos. Shotwell enables you to import photos and video from several sources in different ways. The simplest is to drag and drop a folder or file from the Files application onto the Shotwell window, or you can go down the traditional route via its File menu: choose File > Import From Folder to choose a folder on another drive or camera memory card you've plugged into a reader. Select your folder or drive, and leave 'Recurse Into Subfolders' ticked to ensure the photos inside subfolders are also included when Shotwell adds them to your library. Click OK.

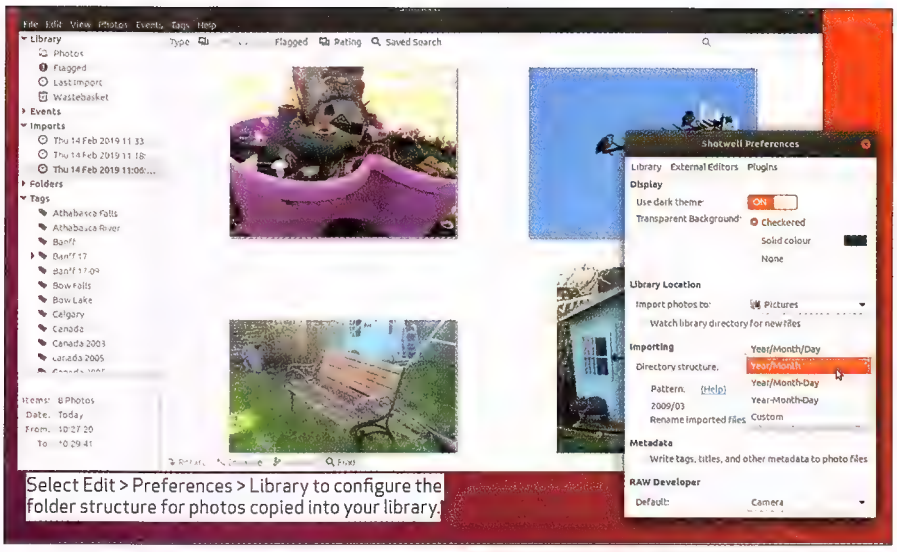
Shotwell will then give you one of two options: 'Copy Photos' physically copies the files into your Pictures folder, organised into subfolders based on the year, month and day corresponding to the datestamp on each photo – for example, 2019 > 04 > 03 for photos dated 3 April 2019. This option will check – and strip out – any duplicates it finds. Alternatively, choose 'Import in Place' and nothing will be copied, but the files become part of your Shotwell library. Should you later move these files, Shotwell will lose the link to them. Shotwell also supports importing files from memory cards or digital cameras – see the box (bottom right) for more details.

If you want to copy photos into a single folder, but don't want to use your Pictures folder for whatever reason, or you don't like the MMMM\YY\DD folder structure, choose Edit > Preferences > Library tab. Start by specifying an alternative location for your Shotwell library – tick 'Watch library directory for new files' if you'd like your library to automatically update whenever new files are copied into the library folder.

You can also select a different folder structure from here, such as 'Year/Month' to group photos by month rather than day. Alternatively, select Custom to set up your own chronologically based structure using regular expressions. Click Help next to the Pattern box for a full list, such as '%b' for a three-letter abbreviation of the month name ('Apr') instead of the two-digit number.

ORGANISE YOUR LIBRARY

Shotwell's left-hand pane offers several options that relate to the way photos and videos are organised and viewed – click one to switch to that view. The Library view is self-explanatory – a straight choice between all photos or those you most recently imported, plus the wastebasket to which entries in the library can be dragged. It'll also display missing and flagged photos (more on that shortly). The Shotwell library itself doesn't contain any physical links to your actual photo files; instead, think of it as a virtual database layer that sits on top of your photos. This means that anything you 'do' to your photos in Shotwell – whether organising them by adding tags or altering their date, or by editing the photos themselves – isn't applied to the physical files. In other words, it's non-destructive by default, but if you want to apply certain changes to the real files there are ways to do this, as we'll see.



Select Edit > Preferences > Library to configure the folder structure for photos copied into your library.

Let's start by looking at the different ways in which Shotwell organises your files. By default, all photos and videos in your library are displayed together, sorted by date, with the newest shown first. You can alter this by choosing View > Sort Photos, where you'll find options for displaying by title, filename or rating, plus choose whether to view in descending (newest or last first) or ascending order.

This view obviously becomes impractical incredibly quickly, which is where all the viewing and filtering options become useful. First, without doing any additional work you can browse by date using the Events view. Click 'All Events' or select a year or month from the list to group all photos by date. Roll your mouse over an individual day to see quick-fire previews of all the photos inside, then double-click to show just the photos taken on that day. Other viewing options include Imports, which records each separate import from file or camera, and Folders, which is useful if you don't keep all your photos in a central location. One final option for browsing is tags, which is based on keywords that are attached to individual photos. These can be anything you like – a place or person, for example, and the benefits of clicking them are obvious.

These viewing options form the crux of Shotwell's organisation tools. Let's begin with Events. As we've seen, by default Shotwell uses days to create individual events, but you can create your own named events that can either span multiple days or split an individual day into two or more

Import photos from a camera

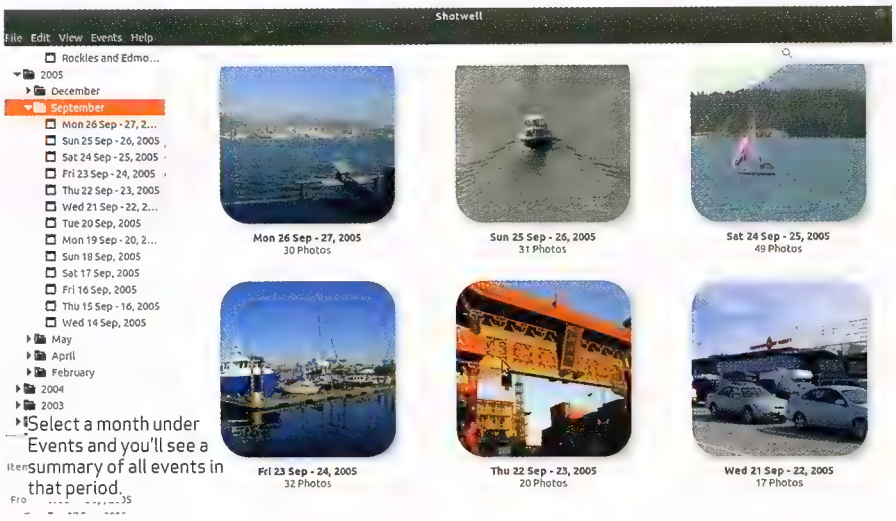
You can also import directly from your camera – Shotwell uses gPhoto 2, which supports most models (visit **www.gphoto.org/proj/libgphoto2/support.php** for a list of over 2,500 models). Connect your camera to your PC with a USB cable, then with Shotwell open, switch the camera on. After a short pause you should see your camera's pictures fill the Shotwell window – look in the left-hand menu where you should see a new Cameras submenu with a 'Mass Storage Camera' entry indicating it has been recognised.

Tick the 'Hide photos already imported' to prevent accidentally importing the same photo twice in future, then either click 'Import All' to bring them all across to your photo library, or Ctrl-click those photos you wish to import before clicking 'Import Selected'. Wait while Shotwell imports the photos – you'll see each photo appear one after the other, and then click Keep or Delete depending on whether you want to leave the photos on your camera or not.

parts (for those busy days when you cram in two or more engagements).

If you're splitting a single day into two or more events, simply select the day, then hold Shift as you click on the first and last photo you wish to group into a single event, before choosing Events > New Event. If you're creating an event from photos spanning more than one day you'll need to select the month in which they appear under Events (or the year, if the event is split across two or more months). From here Shift+click on the first and last days to select them all, then choose Events > Merge Events.

The photos will then be grouped together under a single event that's named according to the date(s) it occurred on. Select this, right-click and choose Rename Event to give it a more memorable name – it'll remain organised by month and year to help you locate it in future. If you want to add a comment – basically a description packed with keywords you can use to locate the event later if necessary – right-click the event name and choose 'Edit Event Comment...'



Select a month under Events and you'll see a summary of all events in that period.

ORGANISATION OPTIONS

It's also possible to label photos individually or in selected batches. You can add titles, comments and tags (keywords), all of which can help you find them. Select a photo or group of photos and you'll find options for adding a title and comment under the Photos menu, while the Tags menu enables you to both add new tags and modify existing ones. Tags are a good way of adding locations to your photos; you could for example make it a rule to include a town, state and country.

You can also rate photos from one to five stars, enabling you to rank your photos or even simply sort your photos from best to worst. Look under Photos > Set Ratings for the options available to you.

One final tool allows you to flag individual photos. The photo's thumbnail is marked with a small grey exclamation mark, enabling you to draw attention to it for whatever reason you like – for example, marking photos that need correcting. Right-click a photo or selection of photos and choose 'Toggle Flag' to switch it on or off as required. When you've flagged one or more photos, you'll be able to view them all together by selecting Flagged under Library.

By default, all of these changes have no impact on the files themselves, but you may find that embedding the metadata into the files could be useful, because it makes that data available to other applications. To do this for all the files in your collection, simply choose Edit > Preferences and tick 'Write tags, titles and other metadata to photo files'. To apply it to individual files only, you'll need to export the file (see below).

SHOTWELL'S IMAGE EDITING TOOLS

Not all photos comes out perfectly, and Shotwell offers some tools to help you make certain improvements. As already stated, these changes are all non-destructive – the underlying file isn't changed, so you can experiment to your heart's content without worrying about ruining the original file.

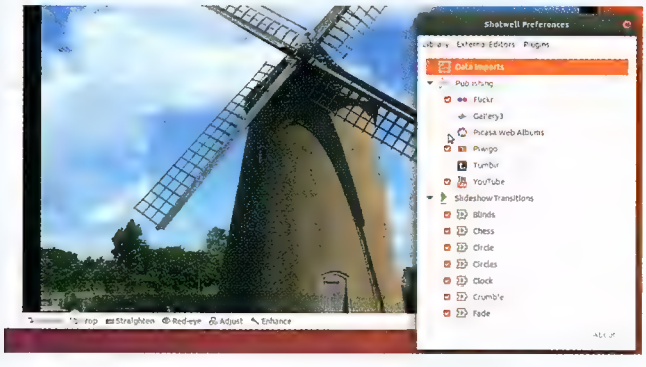
Individual changes can be undone as you make them in the usual way with Edit > Undo, or you can remove all of them at any time by opening the image and choosing Photos > Revert to Original. If you perform any edits, hold Shift to view the photo in its original, unedited form for comparative purposes at any time. If you do make significant improvements to your photos that you'd like to keep, you can save the edited version to disk: choose File > Export and choose any option other than 'Unmodified'. You'll also have the option to export any metadata you've attached to the picture. Either save your copy to a new location or overwrite the original.

Expand Shotwell

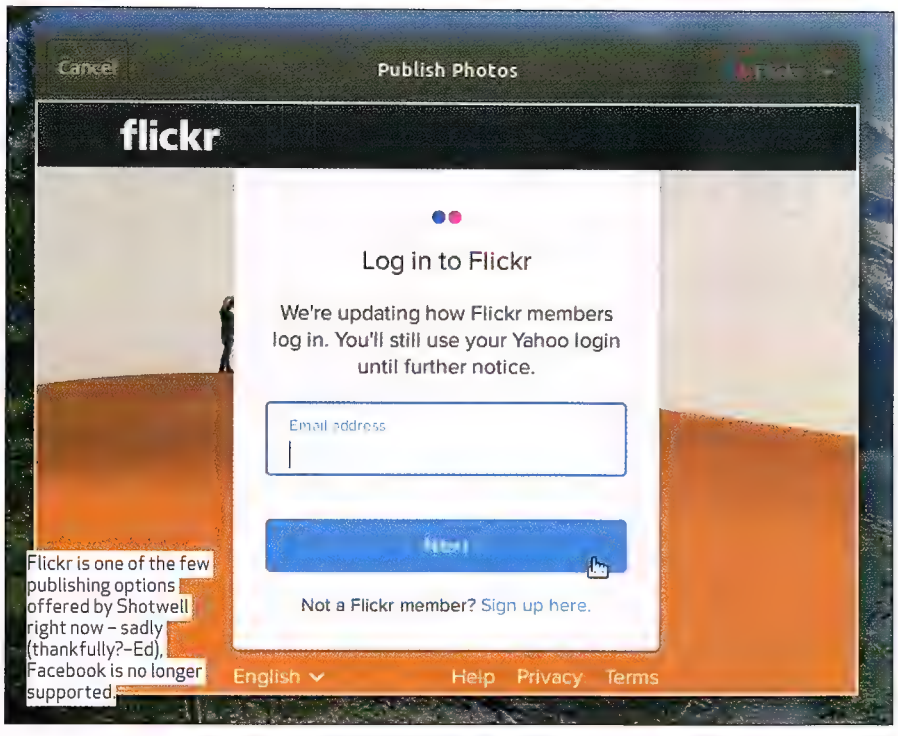
Shotwell's capabilities can be increased through the use of plug-ins, some of which are provided with the program. These are managed via the Edit > Preferences > Plugins tab, and you'll see there are three categories: Data Imports, Publishing and Slideshow Transitions.

These are the only plug-ins currently published and available for Shotwell, and they do change over time – for example, an option to publish to Facebook was recently removed as it no longer works.

You can see the current status of Shotwell's plugins by taking a trip to **https://github.com/GNOME/shotwell/tree/master/plugins**, where you'll discover that the obsolete Picasa Web Albums plug-in is in the process of being updated to support publishing to Google Photos instead. If you fancy writing your own plugin, visit **wiki.gnome.org/Apps/Shotwell/Architecture/WritingPlugins** for a complete guide to doing so. After completing your plug-in, open your /Home folder in Files and create the following folder path: ~/.gnome2/shotwell/plugins. Copy your plug-in file to here and restart Shotwell – the plugin should now be available.



Manage Shotwell's plug-ins from the Edit > Preferences dialogue. All currently available plug-ins can be found here.



Flickr is one of the few publishing options offered by Shotwell right now – sadly (thankfully?–Ed), Facebook is no longer supported.

To edit a photo in Shotwell, double-click it and you'll see the controls you need at the bottom of the screen. Most are self-explanatory – Rotate and Crop, for example – while clicking Enhance enables Shotwell to perform automatic adjustments that can quickly improve a photo's lighting or colour balance. All changes can be undone via the Edit menu.

You'll also notice three other options, which require a little more explanation. If you've scanned something in – an old photo or document, for example – chances are it's slightly skewed. Click Straighten to overlay a grid on your photo, then either use the Angle slider to perform adjustments or click and drag the cursor in a line over the photo to realign it along that line's angle. Once done, the photo will update automatically, but until you click Straighten it won't actually apply the change; click Cancel to void it, or Reset to start again.

The Red-eye button's purpose is obvious. First, zoom into the photo so your subject's devilish eyes are magnified, then click Red-eye. A small circle appears in the centre of the photo: start by positioning it over the first eye and using the Size slider to resize it. When it has surrounded the red portion of the eye, click Apply and move on to the next eye.

The final option is the most powerful: if you don't feel that Shotwell's Enhance button has done enough to fix your photo's poor lighting or colour, click Adjust instead. A pop-up window appears, displaying a histogram of the current image. You'll see so-called 'Intensity Threshold' markers appear at either end of it. These change the lightness of the brightest white and the darkness of the darkest black, and are particularly good at correcting washed-out images.

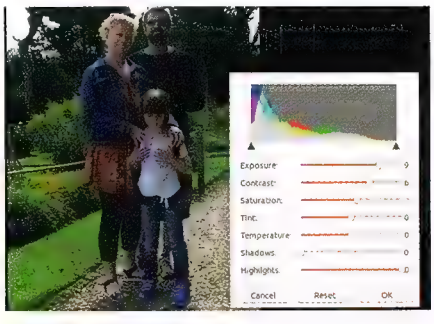
There are also seven sliders you can adjust for additional corrections, including colour issues. The step-by-step guide below walks through these in more detail. It's worth noting that the automatic Enhance button tweaks the Intensity Threshold markers along with the Shadows/Highlights sliders, so if you're not 100 per cent happy with its results, leave Enhance clicked and then focus your tweaks on these tools.

SHARE AND PUBLISH

Shotwell also offers various ways in which you can share your photos with others. The simplest is via email: simply right-click a photo and choose Send To... You'll see similar options to those offered when exporting the photo, but we'd recommend choosing JPEG for starters, then setting a scaling constraint – typically 'Longest edge' – in pixels before clicking OK, at which point the photo will be sent to your email application in the form of an attachment.

There are also several options for publishing your photos online: choose File > Publish or press Ctrl-Shift-P. By default there are options to publish to Flickr, Google Picasa Web Albums and Piwigo for photos, and YouTube for videos. Gallery3 and Tumblr options are also available, but only after enabling the plug-ins – see the box (on the previous page) for more about using those.

Perform manual lighting and colour adjustments

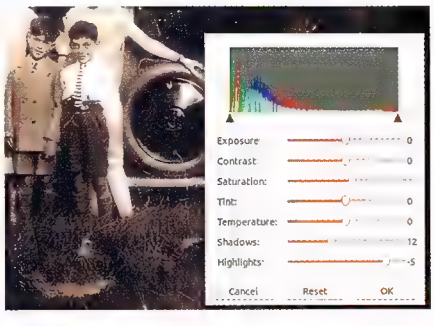


1 ADJUST EXPOSURE

The Exposure slider creates the effect of changing a photo's exposure time – push the slider right to lighten an underexposed photo, or left to darken it. The Contrast slider helps counter washed-out photos (push right) or narrow the range between dark and light (push left).

2 TWEAK COLOUR BALANCE

Photo looks washed out? Try pushing the Saturation slider right to inject more colour. Drag it all the way left to remove the colour so it becomes greyscale. If your camera has incorrect white balance settings, use Tint to correct them by adding more red (move it left) or green (right).



3 ADDITIONAL ADJUSTMENTS

Use the Temperature slider to make cold-looking photos warmer (or vice versa). The Shadows slider is useful for bringing out detail hidden in dark areas of the image, while the Highlights slider enables you to reduce the number of bright areas. Use Shadows and Highlights together.

CD-quality audio recording – on your Android phone

Android phones can output decent quality audio – but capture it? Not without help. Darren Yates looks at how to record old-school analog audio into your mobile device.

With help, my Moto G5 becomes a decent digital audio recorder.

Over the last year or so, some of the big names in tech, including Google, Sony and Qualcomm, have been redesigning mobile sound to improve the output quality of short-range wireless audio. But what about capturing high-quality analog audio? With often little more than a basic built-in microphone for voice-grade sound, many Android devices are far better at pumping out near-CD-quality audio than they are at capturing it. However, in many cases with the right combination of software and hardware, you can fix this imbalance and turn your Android device into an excellent multi-channel digital audio recorder, good enough to record music, podcasts and more.

DIGITAL AUDIO RECORDERS

The 1960s might have sparked a social revolution, but it was also a massive game-changer in audio technology. The first modern silicon transistors were hitting the market at around the same time that Philips launched the 'Compact Cassette' and the combination proved electric. Before then, the idea of a 'portable audio recording device' was a bit like the first portable computers – they might've had a handle but if you carried one often, you didn't need a gym membership. Still, portable audio recorders quickly shrank from suitcase size to shoebox size and about one-tenth the weight. Through continual tech improvements, such as dbx and Dolby, cassette recorders survived until the early-2000s and the iPod's growing dominance.

However, while the iPod revolutionised how we consumed music, it went a long way to killing off that tech institution, the mixtape. MP3 audio compression further kicked the audio cassette format to the kerb – Billboard magazine claimed that while the U.S. chewed through 440 million cassette tapes in 1990, it needed just 274,000 in 2007.

But before the iPhone launched that year, the first shoots of new tape-less digital audio recorders had begun to sprout. Music giant Roland offshoot, Edirol, launched one of the first devices, the R-1, in 2004. It recorded 48kHz/24-bit stereo better-than-CD sound onto CompactFlash cards and ran off two AA batteries (and I still have mine).

Since then, the digital audio recorder market has continued to flourish with names like Tascam, Marantz and Zoom releasing multiple models. So while the portable MP3 player couldn't survive the smartphones, digital audio recorders have managed to side-step them. The problem now is that compact hand-held digital audio recorders can capture higher-quality audio than smartphones ten times the price.

SMARTPHONE BUILT-IN OPTIONS

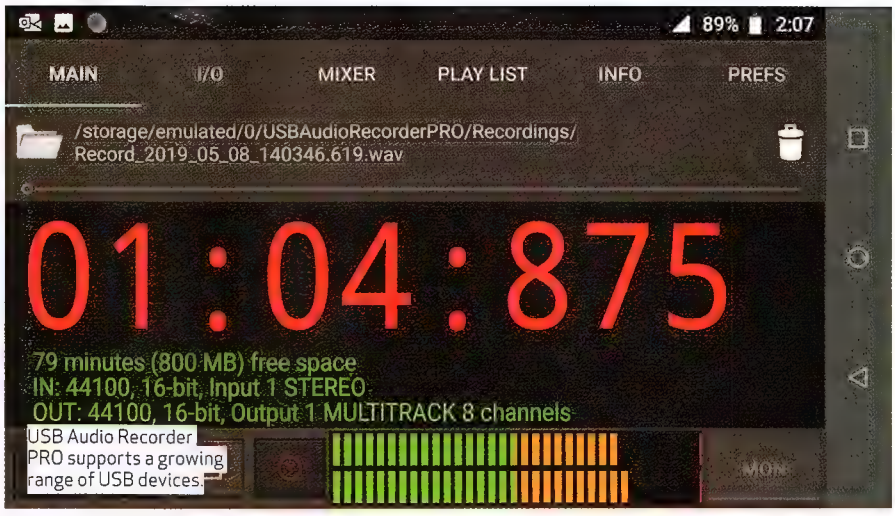
It's wrong to say that the built-in microphone is the only audio recording option smartphones have. If your phone still has a 3.5mm headphone socket, you actually have a second microphone option. These headphone sockets are commonly known as TRRS or 'tip, ring, ring, sleeve' to

> "Despite the fact that USB Audio is now built into Android, the number of apps that support USB audio recording is still quite limited."

Blue's Snowball is one of the more affordable USB microphones.

TASCAM's DR100 MKIII is a high-quality stereo stand-alone DAR.

The Edirol R-1 delivered better-than-CD quality recording back in 2004.



USB Audio Recorder PRO supports a growing range of USB devices.

indicate the four connections they have. A standard pair of headphones requires three connections – left-channel, right-channel and a common ground return line. The fourth connection is the alternate microphone input you might use when listening with mic-equipped earphones and answering a call. However, neither option is considered 'high fidelity' and while they might be fine for voice calls or recording lecture notes, you wouldn't use them to record live music or a podcast.

BLUETOOTH AUDIO RECORDING

Another semi-built-in option is to actually record the audio from a Bluetooth headset. This isn't commonly known and there aren't too many apps out there that support the feature. However, it can be done – what you need is Bluetooth Voice Recorder from Google Play. The app hasn't been updated since 2015, so we're not sure how long it will survive Google's latest Play Store protocols. In any case, it'll capture Bluetooth audio in AAC format at up to 44.1kHz/128Kbps single-channel (mono) format. The problem here is that, while it works, the audio transmitted over the Bluetooth link from the headset to your phone is itself compressed, so in effect, its double-compressed, which again, isn't a great recipe for high-fidelity.

USB-OTG

We've talked a lot in these Android Masterclass pages about Android's USB-OTG (On the Go) port, which provides a two-way USB host port that allows you to hook up a wide array of peripheral devices to your phone. That array extends from microscopes to endoscopic cameras, digital video capture to programmable Arduino maker boards.

It also includes USB sound cards. Google officially added USB audio support to Android in Lollipop/5.x, however, the team at Extream Software Development (**extreamsd.com**) have been building their own USB audio device driver support since Android 3.x. It means their very good USB Audio Recorder PRO app (**tinyurl.com/APC469AUDIO**) supports a decent selection of USB sound cards, audio interfaces and mixers.

USB DEVICE SUPPORT

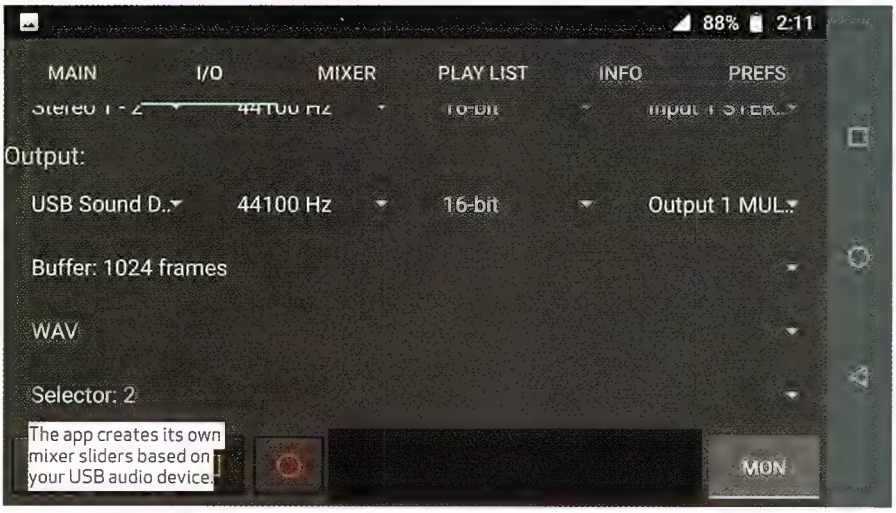
Despite the fact that USB Audio is now built into Android, the number of apps that support USB audio recording is still quite limited. USB Audio Recorder PRO is among the few, yet stands out for its USB Audio device driver. The app costs about $10 on Google Play, so check the extreamSD website (**extreamsd.com/index.php/technology/usb-audio-driver**) and ensure support for your USB device before you buy.

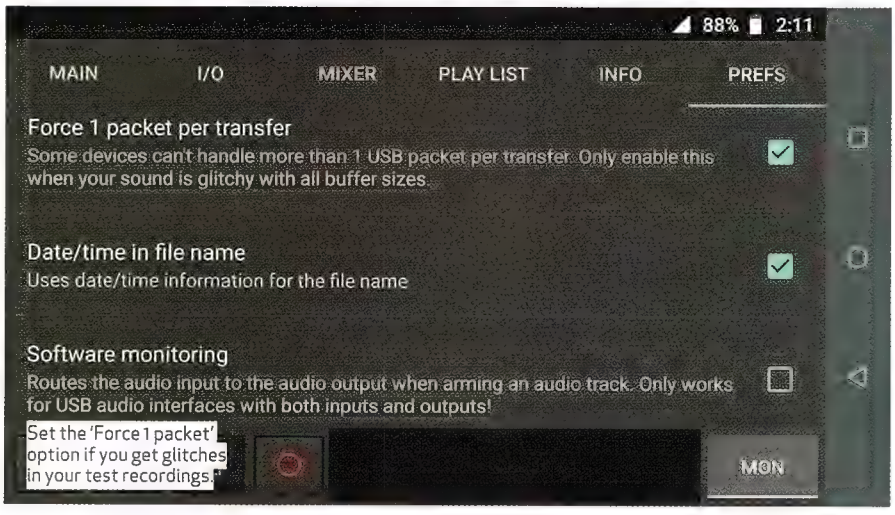
There are a couple of other points to make – one obvious, the other less so. The obvious point is that your Android device must support USB-OTG – while this is true for almost all Android tablets (my $99 Lenovo Tab 7 Essential tablet does, for example), few, if any, sub-$100 phones do. Basically, if your device doesn't have USB-OTG available, this method won't work. The less-obvious point is if your USB audio device is bus-powered (meaning it doesn't have a power supply of its own), it's going to get its power from your phone's battery, so expect a corresponding drop in phone runtime as a result.

Rode's NT-USB is one of the most popular podcasting USB mics.

Don't forget a USB-OTG cable (and a USB-OTG port on your Android device).

A pop filter is always a good idea to prevent 'P's causing distortion pops.




88% 2:11
MAIN
I/O
MIXER
PLAY LIST
INFO
PREFS
Force 1 packet per transfer
Some devices can't handle more than 1 USB packet per transfer. Only enable this when your sound is glitchy with all buffer sizes.
Date/time in file name
Uses date/time information for the file name
Software monitoring
Routes the audio input to the audio output when arming an audio track. Only works for USB audio interfaces with both inputs and outputs!
Set the 'Force 1 packet' option if you get glitches in your test recordings.
MON

MAKING YOUR OWN PODCASTS

Podcasts are hugely popular and a great way to learn new skills, knowledge or just be entertained while stuck on the daily commute. Making your own podcast is something that can be equally fun to do, yet it's also a task that can get expensive real quick. The irony is, it's also something you can do on your smartphone and with quality good enough to give a CD player a run for its money. The trick is understanding what makes good-quality audio and the path it takes from your voicebox to your file storage.

Here, the audio electronics principles that have underpinned high-fidelity audio for the last 75 years continue to hold true – low-noise, low-distortion and as flat a frequency response from 20Hz to 20kHz as you can afford.

MICROPHONES MATTER

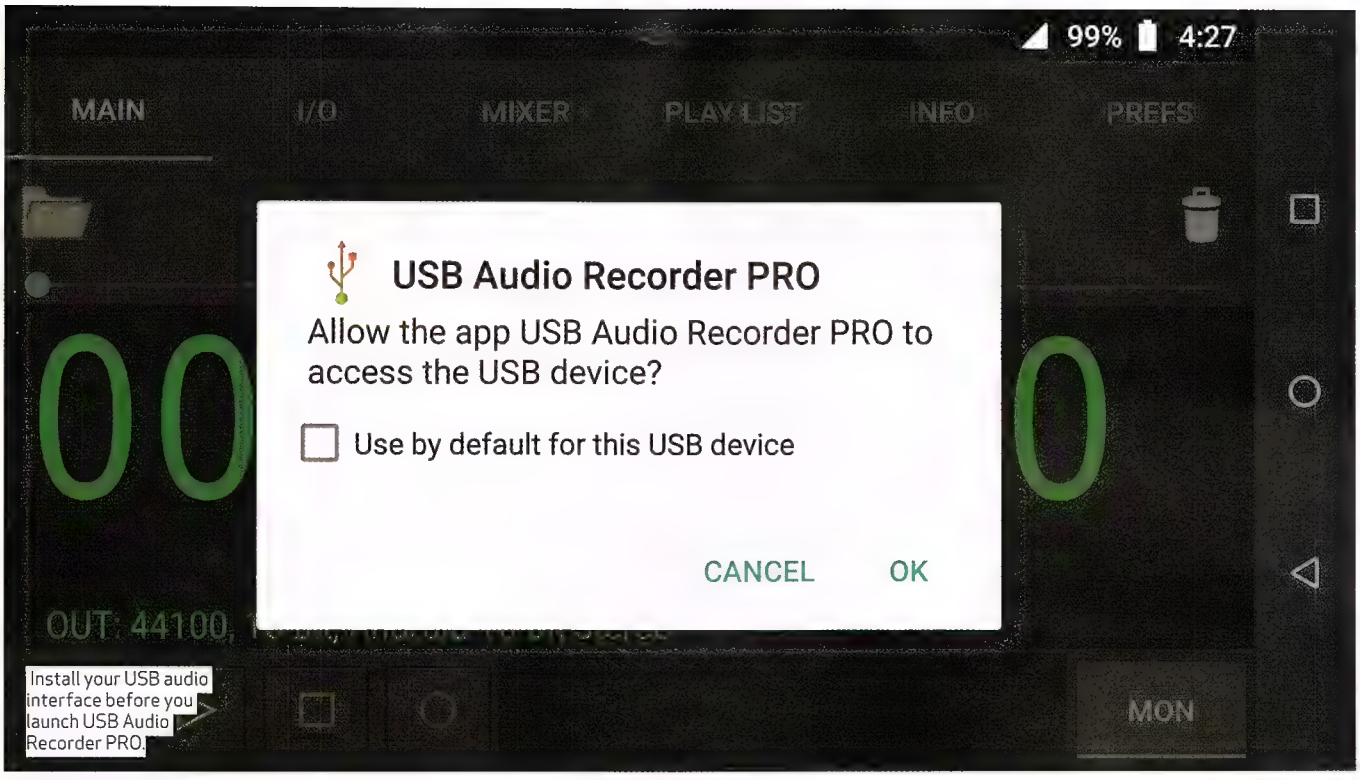
Capturing audio involves multiple links in a chain – you speak, your voice is picked up by the microphone, it converts the kinetic energy of the sound wave into an analog electrical signal, it's then converted into a digital signal and stored in an audio file. Here's a key point to achieving that trifecta of audio quality – while ever the audio signal is in analog form, the potential for degradation, whether by noise (hiss), distortion or frequency response, is high. That's why the quality of microphone you use is important. Note I said 'quality', not 'brand'. If you find a low-noise, high-output cardioid microphone that has a broad, flat frequency response, then it should do just fine.

Making a solo podcast is the easiest form to create, since it's just you and a microphone. The bonus here is that if you choose a good USB microphone, the chances are you can plug this straight into your phone's USB-OTG port and record it through USB Audio Recorder PRO. The current list of supported USB audio devices is pretty decent and you'll find popular USB podcast-ready microphones included, from Rode's Podcaster (although no mention of the Mk. II) and NT-USB to the more affordable Blue Snowball. The key is confirm your desired option with the website above before you buy.

MULTI-TRACK OR MIXING

A single USB microphone is the easiest option because it does the work of capturing the audio and the analog-digital conversion (ADC) process in one. By the time the audio hits the USB cable as digital-ones and zeros, all the hard work is essentially done – and this is true whether you're using a PC or your phone to record the audio. All the recording device is doing is grabbing the digital data off the USB and writing it to a file – it usually doesn't do anything else during the capture process.

If you need to capture audio from multiple microphones (or prefer a non-USB mic), there are two paths you can take – one is better, one is cheaper. The better, more professional path is to capture each microphone output to a separate audio channel or track. This way, you have ultimate control in how you mix down the channels into the final stereo mix you upload to Spotify or wherever. It's also the most expensive option, not just in terms of storage, but in cost. Multi-channel recording can get expensive quite quickly, particularly beyond four-channels. ExtreamSD claims Behringer's $190-street price U-Phoria UMC404 four-channel USB interface couples up with USB Audio Recorder PRO, so it could be one option worth considering. The benefit here is the UMC404 (and others like it) support industry-standard balanced microphones with three-pin XLR connectors. One way you could hook



this all up would be your four microphones into the UMC404, the UMC404's USB port to a USB-OTG cable and the USB-OTG cable to your smartphone's USB-OTG port.

BUDGET STEREO CAPTURE

The even-cheaper option would be a budget analog mixer that gives you a single-channel 'mono' or two-channel 'stereo' line-level analog output. You can then feed that into a supported USB sound card's line-level input and capture that through USB Audio Recorder PRO. There are any number of USB sound cards supported by the app, going back to the Sound Blaster Extigy and Audigy 2 NX, to Lexicon's Alpha, Lambda and Omega devices along with many more.

HOOKING UP WITH USB AUDIO RECORDER PRO

You need to ensure your USB audio interface is already plugged into your phone's USB-OTG port before you launch USB Audio Recorder PRO, otherwise, it'll just fail with an error. The app locks into landscape mode with quite a decent interface – transport buttons, LED meter and live-monitor button on the bottom, a big timestamp window with input/output availability in the middle and an options menu across the top.

If you tap the 'mixer' menu option, you'll be greeted with a scrollable mixer console with soft sliders for various channels – what's impressive about this is that it's dynamically created based on the channels available in your USB audio device, so it looks different for every device. If you connect some sound to your audio device, you'll likely need to try all of the sliders to work out which sliders control which inputs. For initial testing, we recommend setting all channels to maximum levels – you'll see why in a moment.

Now tap the 'I/O' option on the menu and you get the basic input/output parameters. It usually defaults to the inputs and outputs of your USB device – we'd suggest setting the buffer level to just 1024 frames to begin with. Also depending on your device, you may need to scroll down to see the 'Selector' option. We're not quite sure what this does, other than correctly link the USB audio stream to the app. The problem is that you may need to trial-and-error it to find the right setting for your USB device. If you plug in some external audio and press the monitor on, the LED meter should light up. If not, stop the monitor and select a different 'selector' value and try again. If your audio device is on the support list for USB Audio Recorder PRO, one of those values should work and when it does, you shouldn't need to adjust it again.

Now you can go back to the 'mixer' menu, pull down all the sliders and work out which ones control the inputs of your USB audio device. Next, tap the red-circle record button and record some audio. After a while, press the square stop button, press the right-arrow play button and you should hear what you just recorded and at the same quality (the I/O menu lets you set the audio quality, which normally defaults to a CD-standard 44.1/16-bit stereo WAV format).

When you've got the hang of it, lay down some tracks and see how you go. Record in WAV format and you can easily copy those files to Audacity on your PC, or grab WaveEditor from Google Play (**tinyurl.com/APC469WAV**) and edit straight on your phone.

PLENTY OF OPTIONS

Using an Android smartphone or tablet to create your own podcasts might not seem like the brightest of ideas, but if you live your life on your phone, why not create your content on your phone? Sure, we're mixing in some extra hardware help in the form of microphones and USB audio interfaces to achieve somewhere close to CD-quality, but then again, these extras are needed for any similar PC or laptop setup anyway.

As we continue to keep finding, there aren't too many things most Android devices can't do.

Behringer's UMC404 interface is supported by USB Audio Recorder PRO.

Tweak your Raspbian config to perfection

Helping you to perfect your Pi project, Christian Cawley explains the best way to customise your Raspbian config file.

The chances are that when you flash a new image to your Raspberry Pi's microSD card, you're doing it wrong. While the Pi's default desktop experience in Raspbian has improved, the configuration side of things hasn't really matured as much as it could have. The result is you booting up with a keyboard, mouse and monitor attached, and setting up wireless networking, SSH and various other options.

But while the pre-boot configuration could be better, it isn't completely absent. A Raspberry Pi running Raspbian Stretch – and some other operating systems, but we're concentrating on Raspbian – can be configured while the microSD card is still inserted in your PC. Wireless networking and SSH can be pre-configured, as can settings for the display, memory and even overclocking.

This is thanks to the Pi's /boot directory, where files for the wireless configuration and SSH can be created. It's also where you'll find config.txt, a text file that stores configuration information for the Raspberry Pi as it boots the operating system.

Ready to pre-configure your Raspbian installation? After writing the operating system disk image file to microSD, browse to the /boot folder in your file manager or Terminal. Here, create a new file in nano:

```
sudo nano wpa_supplicant.conf
```

Copy the following into the file:

```
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
network={
ssid="YOUR_NETWORK_NAME"
psk="YOUR_PASSKEY"
key_mgmt=WPA-PSK
}
```

This basic script is straightforward. Edit the SSID so that it matches the name of your wireless network. Similarly, set PSK to your network's password, then press Ctrl-X to save and exit the file. When the Raspberry Pi boots up, these details will be detected and automatically loaded into Raspbian's wireless settings. Your Raspberry Pi will be online almost as soon as it boots.

Another easy configuration option for Raspbian is to set up SSH access before you've booted your Pi. The benefits of this are considerable. Being able to boot a Raspberry Pi, have it connected to your network, and be able to remotely access the computer saves a lot of messing about. There's no need to hook up a keyboard, mouse, and display – the Pi will be ready for action.

To enable SSH, once again open your file manager or terminal emulator in the /boot directory. Here, create a new file, simply labelled ssh:

```
sudo touch ssh
```

That's all you need. When the Raspberry Pi boots, Raspbian will detect the ssh file and take this as an instruction to enable SSH access. Any SSH app, whether it's an FTP app with SSH support or a command line tool, can then securely connect to your Raspberry Pi over Wi-Fi.

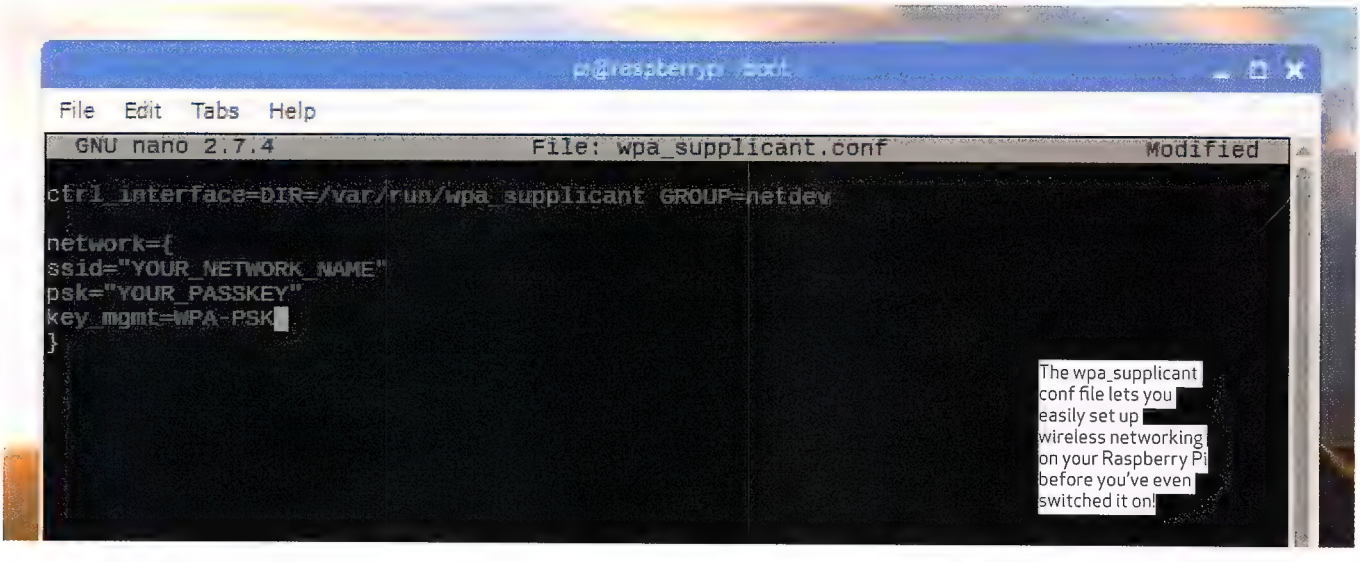
CONFIG YOUR CONFIG.TXT

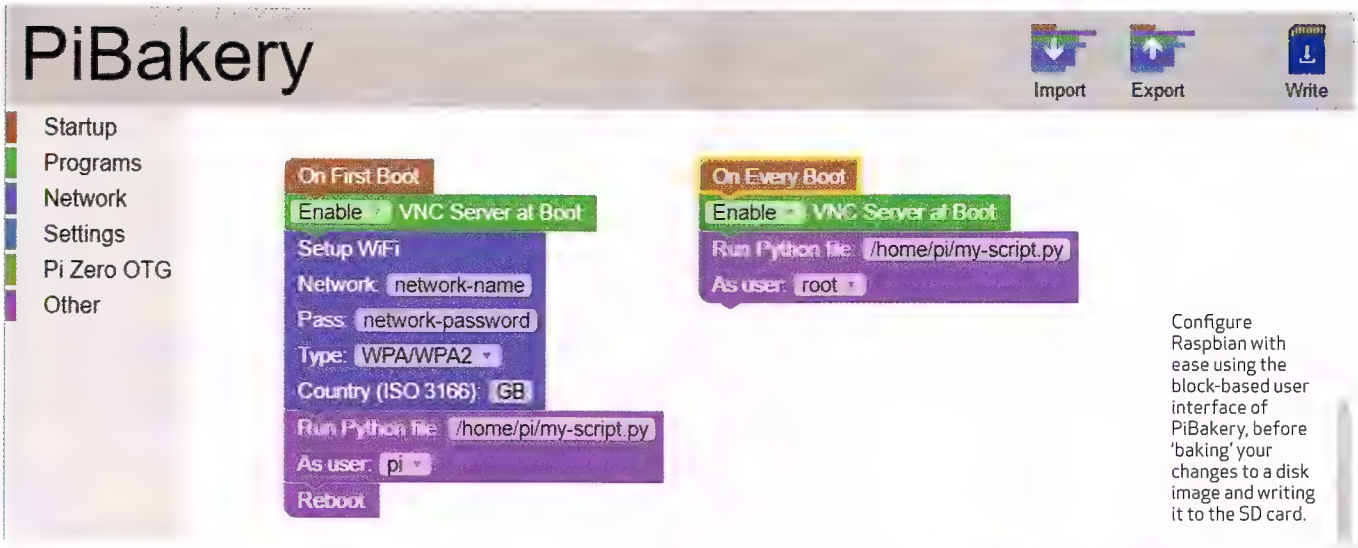
If you're looking for a greater selection of pre-boot tweaks, you'll need to look at the config.txt file, also in boot. This is a list of configurations organised using the basic format of a property=value statement, all on one line. For example, to set the HDMI cable to a display as the default output for audio from the Pi, you would use

```
hdmi_drive=2
```

You have three main options for editing config.txt. The first is from within Raspbian while your Raspberry Pi is running. However, any changes made to the file will not be applied until you reboot. You may also remotely access config.txt via SSH, editing it in nano or whatever text editor you prefer. Finally, of course, you can edit it on your desktop computer.

This can be done before you boot Raspbian for the first time, or at any point in future. All manner of settings can be adjusted, from audio and video


File Edit Tabs Help
GNU nano 2.7.4 File: wpa_supplicant.conf Modified
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
network={
ssid="YOUR_NETWORK_NAME"
psk="YOUR_PASSKEY"
key_mgmt=WPA-PSK
}
The wpa_supplicant conf file lets you easily set up wireless networking on your Raspberry Pi before you've even switched it on!



Configure Raspbian with ease using the block-based user interface of PiBakery, before 'baking' your changes to a disk image and writing it to the SD card.

options to the camera, GPIO, and beyond. Before proceeding, however, it's a good idea to make a copy of the config.txt file. This will ensure that you can overcome any issues that may transpire. For example, specifying the wrong setting when attempting to overclock your Pi will result in the computer not booting. By restoring the original file, you can easily resolve this.

So prior to editing config.txt, make a copy with mv:

```
mv config.txt backupconfig.txt
```

To restore the backup use rm to remove the new config.txt, then reverse the previous command:

```
rm config.txt
mv backupconfig.txt config.txt
```

With the config.txt file open, you will see that many lines of text start with a # comment symbol. This prevents the lines being read by the operating system; removing the hash 'activates' the command. It's a useful method of leaving notes in the file, too, to explain what each group of commands do.

You now have a host of settings that can be adjusted. Most of these will not need changing, however; the Raspbian developers have configured the operating system to be as useful as possible for the widest set of parameters. However, some systems need a bit of individuality. For example, you might be building a project that requires the GPIO pins to be reconfigured. Fortunately, this is possible under the GPIO section of config.txt.

For example, to configure pins 12 to 16 as inputs, use the gpio directive, along with the ip command (standing for 'input'):

```
gpio=12-16=ip
```

Bear in mind that changes here can be overridden when Raspbian is running using raspi-gpio.

Usually the Pi's memory split is managed in raspi-config. However, this can be managed using the gpu_mem command in config.txt. You need only specify the amount of memory for the GPU: the remainder will be allocated to the system RAM. For example, using gpu_mem_256 sets the GPU memory to 256MB. You can go as high as gpu_mem_1024, but note that if the Pi's total RAM is lower than the figure you're specifying, the command will not work. This does mean, however, that you can specify multiple gpu_mem values on an SD card that you plan to swap between multiple models with differing amounts of RAM.

With options for overclocking, kernel instructions, audio visual settings, and even including additional configuration files (useful if you have multiple changes you regularly make to the default config.txt), it's worth spending some time browsing the file to get a grip of just what pre-boot tweaks are possible in Raspbian

BAKING YOUR CONFIG

As straightforward as config.txt is, it isn't the most forgiving environment, and changes can have disastrous results. Happily, a tool called PiBakery is a user-friendly alternative. Available from **www.pibakery.org**, you can set this up on Linux from source, or install it on macOS or Windows. PiBakery comes with Raspbian (and Raspbian Lite) built in, and offers a sensible, Scratch-style block-based UI. Blocks are provided for different types of configuration; for example, Startup actions, Network settings, and more.

These can be dragged into place, individual parameters set, and then the whole thing is baked into Raspbian as the OS is written to your SD card. For example, using the On First Boot block enables easy initialising of your Wi-Fi connection, SSH configuration and even VNC server. These blocks can be dragged, dropped, configured and saved. Configurations can also be imported and exported thanks to XML support, making it the ultimate pre-configuration tool. ■

Try PiBakery v2, too

Another option for pre-configuring your Raspberry Pi's installation is PiBakery v2, which includes a host of extra features.

For example, you're no longer limited to the PiBakery version of Raspbian. Any Raspbian-based IMG file can be used, potentially enabling easier setup of RetroPie, OSMC, and other distros. Like the original PiBakery, it supports Raspbian Lite and the full version. PiBakery v2 can also handle editing of any Raspbian microSD card, rather than being limited to ones created with PiBakery.

Also on offer is improved Linux support (the original is limited to Windows and macOS unless you compile) and the ability to import XML files from previous versions. Multiple block sources can be added, enabling you to maintain your own custom blocks.

All of this means that all configuration of a Raspbian-based distro for your Raspberry Pi can be done from the comfort of your PC, meeting the requirements of the project you're planning.

Even if you're only looking for an easier way to set up Wi-Fi, PiBakery v2 should prove to be the best option for anyone who wants to prepare and tweak Raspbian.

Working with lists in Python

Lists are one of the most important Python features for machine-learning. Darren Yates explains why they're so important, how they work and how to maximise their value.

When we began preparing to look at machine-learning in Python with our initial two-part primer a few issues ago, we very briefly touched on the concept of lists. Like a column in a spreadsheet, a list is an incredibly versatile and important component of Python for allowing you to access a sequence of data through a simple numeric index. This month, we're unpacking lists in more detail and looking at how you can manipulate them in ways that make sense from a machine-learning perspective.

LISTS 101

The majority of machine-learning algorithms rely on receiving data in a common flat or two-dimensional spreadsheet form – each similar event or 'record' appearing in rows, while features or 'attributes' of those records are shown in columns. The 'list' data structure in Python allows a large block of data to be stored within a single name reference variable where each element can be accessed by a single numeric index. Lists can go by different names in other languages – for example, in Java, it's an 'arraylist', but essentially they describe the same basic structure or 'object'.

One important feature about lists in Python is that they are 'mutable', which is just software development-speak for saying that lists can be changed once they're created. A more primitive form of list called a 'tuple' in Python or an 'array' in other languages cannot. For Python lists, this 'mutability' means you can append (add new elements to the end of a list), delete (remove) and insert new elements within a list using a series of built-in functions.

GET THE SOFTWARE

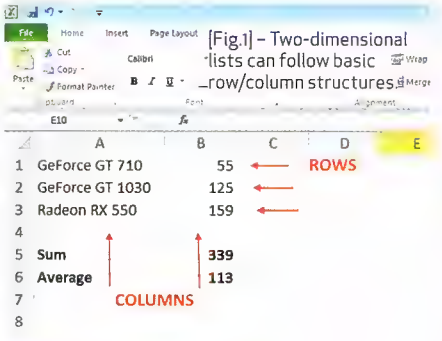
If you're new to our 'Machine-Learning with Python' series, you're not too late to join in. Head to python.org, download the latest version 3.7 release of the Python programming language for your device and install it. You'll find the source code for this month's episode on the APC website at **apcmag.com/magstuff**. Download it, unzip it and load the files in turn into the Python IDLE integrated development environment editor. Press <F5> to run the source code or 'script'.

```
# Machine Learning with Python
# Darren Yates - 8-May-2019
# Python Primer - Lists

listVideoCards = ['GeForce GTX 1650','Radeon RX Vega 10','GeForce RTX 2060']
print('Here is the initial list of "listVideoCards":\n',listVideoCards)
print('\nCard named in element 1 is', listVideoCards[1])

listVideoCards.append('Radeon RX 590')
print('\nHere is the updated list of "listVideoCards" after appending:\n', listVideoCards)

del listVideoCards[2]
print('\nWe have now removed element 2 from the list, which now looks like:\n', listVideoCards)

listVideoCards.insert(0, 'GeForce GTX 280')
print('\nHaving inserted a new card, here is the new list now:\n', listVideoCards)
```

Python lists are mutable – you can append, insert and delete at any time.

```
Python 3.7.1 (v3.7.1:260ec2c36a, Oct 20 2018, 14:57:15) [MSC v.1915 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
====== RESTART: C:/Users/Darren/Documents/2019 Python code/5/listgc.py ======
Here is the initial list of "listVideoCards":
 ['GeForce GTX 1650', 'Radeon RX Vega 10', 'GeForce RTX 2060']

Card named in element 1 is Radeon RX Vega 10

Here is the updated list of "listVideoCards" after appending:
 ['GeForce GTX 1650', 'Radeon RX Vega 10', 'GeForce RTX 2060', 'Radeon RX 590']

We have now removed element 2 from the list, which now looks like:
 ['GeForce GTX 1650', 'Radeon RX Vega 10', 'Radeon RX 590']

Having inserted a new card, here is the new list now:
 ['GeForce GTX 280', 'GeForce GTX 1650', 'Radeon RX Vega 10', 'Radeon RX 590']
>>>
```

Lists automatically update element order based on your operations.



[Fig.1] – Two-dimensional lists can follow basic row/column structures.

BASIC LIST FUNCTIONS

There are half-a-dozen or so standard list functions to get your head around. The first is using indexes and it's pretty easy. All lists use zero-based indexes, which means the first element in a list has index 0, the second element index 1 and so on. You access them using the basic form:

```
newList[index_value]
```

Say, for example, we have a list of video cards:

```
listVideoCards = ['GeForce GTX 1650', 'Radeon RX Vega 10', 'GeForce RTX 2060']
```

To print the value of the second element, we can use:

```
print(listVideoCards[1])
```

and we'd get 'Radeon RX Vega 10'. To add a new card to the end of the list, we use the append() method:

```
listVideoCards.append('Radeon RX 590')
```

We can delete elements in lists using two options – by index or by name. For example:

```
del listVideoCards[2] and listVideoCards.remove('GeForce RTX 2060')
```

do the same thing.

WHAT HAPPENS WHEN YOU DELETE

However, it's important to understand what happens when you delete (or insert) an element from (or into) a list. When you delete an element, all the elements that follow the deleted element immediately shuffle up. So, if you delete element 2, element 3 now becomes element 2, element 4 becomes element 3 and so on for the rest of the list. Why is this important? Say you want to delete elements 2 and 3 in a list. You don't delete element 2, then element 3

```
# Machine Learning with Python
# Darren Yates - 8-May-2019
# Python Primer - Sorting

# Python lists also feature built-in sorting support...

listNumbers = [4,8,1,23,14,89,6,55,2,7,9,5,3,43]
print('The original list of numbers is:\n', listNumbers)

listNumbers.sort()
print('The sorted list of numbers looks like:\n', listNumbers)

# You can use sorting to make finding the median (middle) number easier...
medianIndex = (len(listNumbers)-1)/2
if (medianIndex % 1 != 0):
    medianValue = (listNumbers[int(medianIndex)] + listNumbers[int(medianIndex+1)])/2
else:
    medianValue = listNumbers[medianIndex]
print('\nThe median value is the middle value of a list.')
print(' --- If the list has an even-number length,')
print(' --- the median is the average of the middle-two values.')
print('\nThe median value of the list is:', medianValue)
```

Python's list object includes useful extras such as sorting.

```
Python 3.7.1 (v3.7.1:260ec2c36a, Oct 20 2018, 14:57:15) [MSC v.1915 64 bit (AMD6
4)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: C:/Users/Darren/Documents/2019 Python code/5/listsort.py =====
The original list of numbers is:
 [4, 8, 1, 23, 14, 89, 6, 55, 2, 7, 9, 5, 3, 43]
The sorted list of numbers looks like:
 [1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 23, 43, 55, 89]

The median value is the middle value of a list.
 --- If the list has an even-number length,
 --- the median is the average of the middle-two values.

The median value of the list is: 7.5
>>>
```

You can use sorting as a way to make your own median function.

"There are half-a-dozen or so standard list functions to get your head around."

```
# Machine Learning with Python
# Darren Yates - 8-May-2019
# Python Primer - Two-dimensional lists

tableCards = [ ['GeForce GT 710', 55],
               ['GeForce GT 1030', 125],
               ['Radeon RX 550', 159] ]
print('The table of graphics cards, where each card is a row, is:\n', tableCards)

print('\nThe name of the GPU in row 2 is', tableCards[1][0])

# We can access each row using a for-in loop
sumPrice = 0
print('The table of cards includes:')
for card in tableCards:
    print('\tCard/GPU type:', card[0], '\tStreet price: $', card[1])
    sumPrice += card[1]
print('\nTotal price for the cards in this list is  : $', sumPrice)
print('Average price for the cards in this list is: $', sumPrice/len(tableCards))
```

Python lists support two-dimensional use, great for making tables.

```
Python 3.7.1 (v3.7.1:260ec2c36a, Oct 20 2018, 14:57:15) [MSC v.1915 64 bit (AMD6
4)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
==== RESTART: C:/Users/Darren/Documents/2019 Python code/5/tablecards.py ====
The table of graphics cards, where each card is a row, is:
 [['GeForce GT 710', 55], ['GeForce GT 1030', 125], ['Radeon RX 550', 159]]

The name of the GPU in row 2 is GeForce GT 1030
The table of cards includes:
        Card/GPU type: GeForce GT 710   Street price: $ 55
        Card/GPU type: GeForce GT 1030  Street price: $ 125
        Card/GPU type: Radeon RX 550    Street price: $ 159

Total price for the cards in this list is  : $ 339
Average price for the cards in this list is: $ 113.0
>>>
```

Python lists also support mixing data types, such as strings and numbers.

– you delete element 2 and then element 2 again. Why? Because after deleting element 2, element 3 has automatically moved up to be the new element 2, so you have to delete element 2 again to get rid of what used to be element 3. Confused? It sounds like a 'Yes, Minister' or 'Monty Python' skit, but you have to keep in mind that Python executes one command at a time and updates all affected object values before executing the next command.

In fact, the same sort of thing happens in reverse when you insert an element into a list. Say for example, we use the command:

```
listVideoCards.insert[0, 'GeForce GTX 280']
```

This inserts the value 'GeForce GTX 280' at the front of the list as element 0, but it also immediately pushes the previous element 0 into element 1 and so on.

LISTS OF LISTS

In terms of machine-learning, though, a one-dimensional list isn't really all that useful. However, if we talk about 'lists of lists', that's a different matter. Another name for a 'list of lists' is a two-dimensional list, or what we know as a spreadsheet or 'table'.

The table in Fig.1 shows a simple spreadsheet of video card GPU models and street prices, with each row representing a different card. To represent this as a two-dimensional list in Python, you could write:

```
tableCards = [ ['GeForce GT 710', 55], ['GeForce GT 1030', 125], ['Radeon RX 550', 159] ]
```

As before, the square brackets indicate the start and end of a list, but now we have nested lists, with each of the three internal lists being a row in the table. You can also access each element or 'cell' within the table similarly to a single list – the difference here is you use two indexes. For example, to print the name of the GPU in row 2, use:

```
print(tableCards[1][0])
```

The first index references the row (remember, they're zero-based), starting from the top and the second identifies the column, starting from the left. In this case, we'd see 'GeForce GT 1030'.

If you cycle or 'iterate' through a two-dimensional list's rows using a for-in loop, you only need one index to access each row. Look at our 'tableCards.py' source code to see how this works. The other thing worth noting is that our tableCards two-dimensional list combines strings or text (denoted by the quote marks) with numbers (no quote marks) in the same row list. This ability to mix data types is one of Python's key strengths. You'll see how we've used this is the tableCards.py code also.

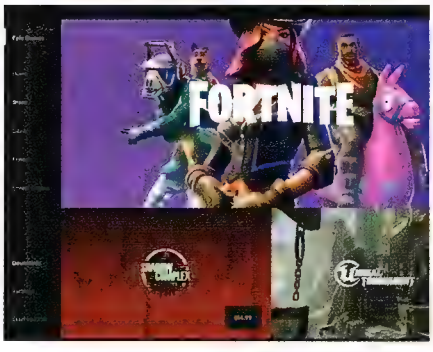
GIVE IT A GO

You'll always understand machine-learning in Python more when you understand how the Python language itself works, so load up the source code and give it a try. In fact, go hard and modify the code – change things around, run it and see what happens. The more you code, the better you get at it. We'll see you next time. ■

Dark Souls studio rumoured to be working with George R.R. Martin

A FANCIFUL REPORT INCHES CLOSER TO THE TRUTH.

Back in March, word of a new From Software game written by George R.R. Martin made small waves online, but the rumour was mostly ignored due to how unfeasible it seemed. Fast forward to May, and George R.R. Martin has confirmed on his website that he's "consulted on a video game out of Japan". There's absolutely no confirmation that From Software – the studio behind *Sekiro* and *Dark Souls* –is involved, but we can dream.



Epic Games Store can't yet cope with storewide sales

***FORTNITE* COMPANY'S NEW DIGITAL STOREFRONT IS BAREBONES.**

Epic Games' divisive new storefront launched with a tiny fraction of the features that Steam has, though it continues to attract users thanks to exclusivity deals. But a recent storewide sale revealed just how undercooked the customer-facing enterprise is: rather than simply excluding them from the items for sale, several games including *Vampire the Masquerade: Bloodlines 2* and *Borderlands 3* needed to be temporarily removed from sale entirely, lest customers get a pre-order discount.

Hugely popular *Dota 2* mod gets its own standalone game

Valve may have another hit on its hands.

Valve has announced it will create a standalone version of *Dota Auto Chess*, an astoundingly popular custom game mode for *Dota 2* developed by Chinese studio Drodo Studio. With the help of Valve, Drodo will develop and support a non-Dota Chinese version simply called *Auto Chess*, while Valve will work on the standalone Steam / Dota version.

"In February we flew the Drodo team over from China to chat about the future of Dota Auto Chess, and to see if they'd want to collaborate directly with us," the announcement reads. "We had great conversations, but we both came to the conclusion that Valve and Drodo could not work directly with each other for a variety of reasons. We ended up agreeing that we'll each build our own stand-alone version of the game, and support each other to the fullest."

Drodo has been developing a standalone, non-*Dota* mobile version for some time, and Valve's *Dota* version of *Auto Chess* will be detailed at length "soon".

Xbox claims 'gaming is for everyone'

PHIL SPENCER OUTLINES MICROSOFT'S SAFETY AND MODERATION EFFORTS.

Xbox head Phil Spencer has announced new measures to prevent toxicity in gaming. With the launch of its "For Everyone" page on the official Microsoft website, the company has launched both a PR gambit and what appears to be the beginnings of a concerted effort to combat toxicity.

The material outcomes are somewhat buried in the prose, but can be found if you look hard enough: by the end of the year Xbox Live will get special Child or Teen Accounts, which will allow adult caregivers greater oversight and control over all aspects of the user experience. The Xbox Community Standards agreement has been updated, and 150,000 odd Xbox Ambassadors will "be engaged to embark on new community missions to help create an inviting and safe environment for all gamers."

There's also a rather vague note about industry collaboration. "Because we intend to protect all gamers, we will openly share safety innovations with our industry the same way Microsoft has made PhotoDNA technology universally available to everyone from the police to the tech industry to fight the spread of child pornography," the post reads.

Red Dead Redemption 2 could be being made for PC, according to this physics programmer's LinkedIn

Could the game be coming to PC soon?

Red Dead Redemption 2 is quite a popular game (heavy sarcasm), but a big chunk of players, namely those playing it on PC, didn't get to play the game as it released purely on PS4 or Xbox One last October. But now, thanks to some eagle-eyed Redditors, there's the distinct possibility the game might be released on PC soon, as mention of working on *Red Dead Redemption 2* for PC has been found on a physics programmer's LinkedIn. Oops.

Specifically, under a list of their work as a programmer at Rockstar, this person lists "*Red Dead Redemption 2* – PS4/XBox1 [sic] /PC". Looks like that could be a hint that we're going to get *Red Dead Redemption 2* on PC sometime soon, meaning that everyone who didn't get a chance to play it might now be able to explore its Western world full of horse testicles and Dutch's misguided plans.

We have no clue when *Red Dead Redemption 2* could be released on PC if this leak is real and not just a typo – it did take *GTA 5* three years to make the leap from console to PC, after all...

Payday 2 publisher Starbreeze might not last another year if additional funding can't be found

STARBREEZE'S CEO MIKAEL NERMARK SAYS THE STUDIO IS IN A "CHALLENGING SITUATION".

Starbreeze has been having difficulties for quite some time, with 2018 seeing its project Overkill's *The Walking Dead* get cancelled and withdrawn from Steam following disappointing sales and the loss of backing from Skybound Entertainment. The studio then went under reconstruction in December 2018 in a bid to recover, but, as the report shows, it's still far from being stable.

"The company currently lacks sufficient secured funds to continue operating for the coming 12 months," Starbreeze states in a recent earnings report, "and a liquidity shortfall is expected before mid-year 2019 if no additional funds are provided."

Starbreeze CEO Mikael Nermark outlined in the report how the studio was being hit the hardest, and pointed to lower net sales and higher administrative costs related to the reconstruction and the negative accounting effect of the sale of its latest title *System Shock 3*.

"My main task is to secure financing for the company's future operations. This involves both long-term financing we can use to build the Starbreeze of the future," Nermark stated, "but also making sure that the assets we have determined are unrelated to the core business are managed in a commercially viable way."

Square Enix confirms that its long-awaited remake of *Final Fantasy VII* will still be episodic

THE WAIT TO COMPLETE THE FULL GAME COULD BE EVEN LONGER.

Despite years of delays and staff shuffling, Square Enix has confirmed that the long awaited *Final Fantasy VII* remake will be released in multiple parts. A Japanese press release, translated by Twitter user hansuramu, confirmed that the release would still be split into parts like they originally said alongside when they announced the game in 2015.

The original was sold in a single package on Playstation 1 and some fans had started to believe that multiple delays would encourage Square Enix to ditch the episodic approach. We can safely put those thoughts to bed now.

Watch the *God of War* documentary and prepare for two hours of high highs and low lows

RAISING KRATOS, AN OFFICIAL *GOD OF WAR* DOCUMENTARY, IS ON YOUTUBE NOW.

The *God of War* documentary is here, and it's just under two hours of rare insight into the creation of a modern-day classic. Titled *Raising Kratos*, it was made with years' worth of behind-the-scenes footage from Sony Santa Monica Studio as well as looks back at *God of War's* roots. Though it's an official feature-length production from PlayStation, the documentary still faces up to difficulties that the development team faced over the game's five-year development. You can watch it here: **https://youtu.be/IJZWKBDXXFY**

$99.95 | PC, PS4, XB1 | WWW.BETHESDA.NET

Rage 2

Raging gracefully.

Arriving eight years after its moderately well-received predecessor, *Rage 2* attempts to fully realise the first game's promise of a chaotic, post-apocalyptic sandbox game with *Doom*-quality gunplay. It's no surprise that developer id Software has once again nailed the latter, however, the former has continued to elude the franchise – this despite the involvement of Avalanche Studios, a team which knows a thing or two about open-world mayhem – it created the *Just Cause* series and developed 2015's *Mad Max* game.

For the most part, *Rage 2*'s sandbox approach doesn't add a lot of value to the game, though we imagine that removing its lengthy driving sections would probably bring the campaign's completion time down to around four hours instead of twelve. Of course, while there aren't many story-focused missions on offer, *Rage 2* is padded out with numerous bandit camps to clear and loot chests to discover.

One of our favourite aspects of the previous *Rage* was its racing circuits, and these do return in *Rage 2*, however, they do feel less prominent here. That could be due to a renewed emphasis on the game's other side-distraction, *Mutant Bash TV*, which places you in a variety of booby-trapped arenas facing off against waves of belligerent 'muties'.

Like with Avalanche's *Mad Max* game, *Rage 2* also features convoys of aggressive vehicles that roam the wasteland. These can be entirely avoided, however, they do provide the player with some incentive to track down auto parts and upgrade your own rides with better armour, weapons and boost capabilities.

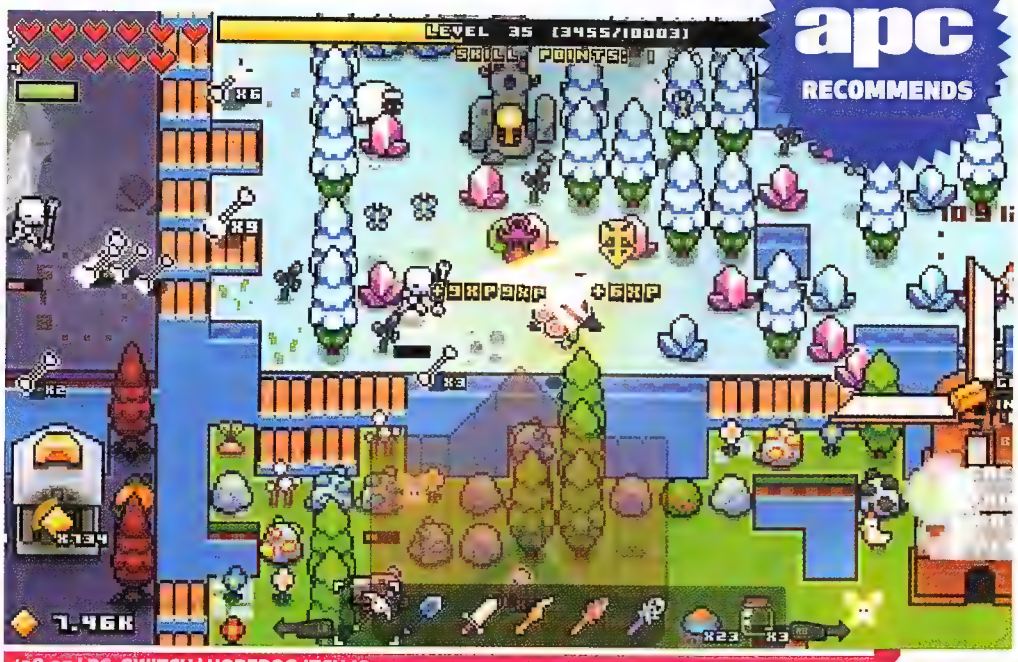
Most of the game's fantastic weapons are also scattered around the wasteland awaiting discovery – a curious design choice which could feasibly result in many players finishing *Rage 2*'s story mode with only half their potential arsenal. Thankfully, we spotted the id-favourite BFG 9000 early on in the game, which fires off an enormous ball of energy that will decimate whatever it comes in contact with (including bosses), essentially acting as an 'instant win' gun. *Rage 2* attempts to balance the gun's overpowered nature by making its ammunition ludicrously expensive, however, even without the BFG, the game's bosses will likely prove unchallenging to those familiar with first-person shooters. Other weapon highlights include the punchy Combat Shotgun, which has the capacity to turn wasteland punks into flying chunks and red mist, and the Smart Rocket Launcher, which can lock onto multiple targets and hit them with a barrage of mini-rockets.

Admittedly, *Rage 2* doesn't leave much of a lasting impression once you've completed the campaign. Its moment-to-moment shooter gameplay is undeniably fun, but the act of repeatedly driving across the wasteland quickly becomes tedious. While the game is filled with colourful characters and interesting locations, the story that's been written around it all is fairly rote by comparison.

■ Stephen Lambrechts

Verdict

***Rage 2* manages to improve just about every aspect of its predecessor, but it's still not great.**



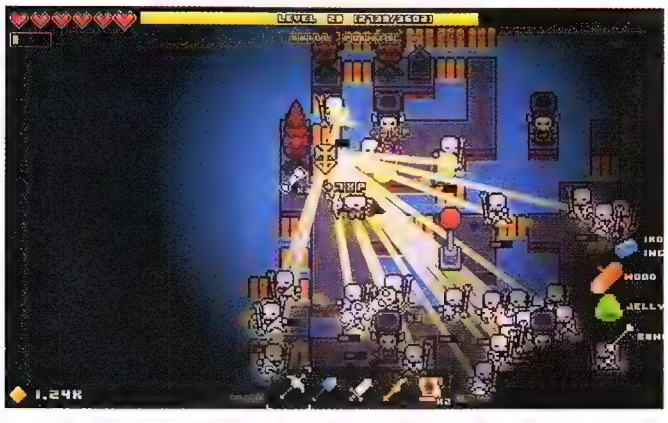
apc RECOMMENDS

$28.95 | PC, SWITCH | HOPFROG.ITCH.IO

Forager

A chill game that never quite lets you relax.

This is a world where flora, fauna and mining outcrops spring anew at lightning pace; it's also a world you make bigger as you progress, making the constant clean-up job more onerous. You'll potter over to some neglected area and strip it clean – chopping down trees, harvesting ore, smashing up baddies. You'll notice the next islet over is in similar straits, and tidy that up too.



Forager presents itself, and indeed frequently feels, like the blissed-out likes of *Stardew Valley*, *Harvest Moon* and *Animal Crossing*. But the pace of the game, defined as it is by the speed at which things regenerate, means that you can never truly relax. The ever-expanding crafting menu helps you mitigate the lightning-paced circle of life, but only to a point. When it's not presenting itself as a farming game, it purports to be a clicker of sorts – asking for lots of input from you early on while promising that, later, said involvement will be automated.

At its core, though, this is a game to be played in the way you want to play it. That is not to say, however, that it lacks rhythm beyond its core loop of farm, harvest and build. Certain islands house dungeons in the top-down *Zelda* style, elementally themed and each designed around their own mechanic. Even if an island doesn't contain a dungeon, it will offer more than another frequently respawning cluster of materials to harvest. There are NPCs offering quests. You might need to slot four coloured gems into statues, a large chest thunking down on the island when you solve the puzzle. Craft a key and inside you'll find a permanent buff. One island contains four skull chests protected by a dozen skeletons and a mid-boss. On it goes, and it's a delightful time: a chill game in a world full of peril that never really threatens you, that is filled with stuff you don't technically need but quite fancy getting because it feels like progress.

■ APC team

Verdict

A smart, deeply enjoyable game.

★★★★☆

apc RECOMMENDS

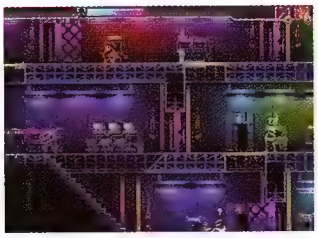
One Finger Death Punch 2

Take that!

$11.50 | PC | SILVERDOLLARGAMES.COM

Following the original, five years of work have spawned a sequel with what appears to be a kitchen-sink approach – more weapons, a faster game speed, more enemies per level and so on – this is a refined, keenly balanced game. While the developer insists the game that it is meant "to be played in bursts", it's terrifically hard to put down. The animation of its stickmen characters is fabulous, there's a zen-like flow to proceedings despite the lightning pace, and bursts of slow-mo strengthen the sense of you being an unbeatable kung-fu master while letting you catch your breath. This is a deeply silly game, that much is certain. Yet it is also terrifically smart. It's a generous game, with over 400 levels in the main campaign, and a host of extra modes. Like the best action games, *One Finger Death Punch 2*'s rhythm gets right under your skin; unlike so many of its apparent genre peers, however, it doesn't insist that you essentially learn a new language to master it. ■ APC team

★★★★☆



Katana Zero

Cutting edge.

$21.50 | PC, SWITCH | DEVOLVERDIGITAL.COM

Katana Zero is guilty pleasure by design. It encourages you to revel in its casual brutality, then forces you to face the disturbing repercussions. At the start, you know nothing about your samurai avatar or the forces tasking him with his murderous assignments. And even as events unfold, a cast of freakish psychopaths and the character's own fragile mental state ensure you never know what's real. Hallucinations, flashbacks and nightmares work proficiently to create a feverish atmosphere.If the twists are well-executed, however, they're also overbearing, as the story hogs too much screen time. In the early stages, where missions are short, the intrigue outweighs the fun. By the time the levels become substantial enough for you to express yourself and build a sustained flow, there's not much left. Yet it doesn't escalate quickly enough for us to fully unleash and confront these dark desires. The action is enjoyable, but we'd have happily done much more of it. ■ APC team

★★★½☆

$8.50 | GRIZZLY.GAMES | PC

Islanders

A building we will go.

***Islanders* is nominally a laid-back, streamlined strategy game about building cities on procedurally generated islands. But it's a city-builder without any of that pesky infrastructure to worry about. There's no resource management to speak of. You've no need to concern yourself with how to get workers from residential area A to industrial zone B. And yet despite its self-imposed limitations, it's still a game where you have to think very carefully about location. That's partly because space is at a premium. You can't flatten out these islands; rather you need to take natural features into account when designing your city. And progress depends on how you arrange your buildings: each comes with a points tally when placed, which can rise or fall depending on where it lies in conjunction with others. You'll need to reach a certain total to unlock one of two packs of six buildings, repeating until you eventually accumulate a score big enough to move on to a fresh challenge on a larger archipelago.**

The minimalistic interface immediately shows you how many points you'll get for placing a structure in a given spot, with smaller numbers next to the buildings that are influencing that score. Sawmills, for example, will gain you more points when placed close to lumberjacks and warehouses, but they'll lose some if another sawmill is nearby.

Despite its soothing ambient soundtrack, Islanders isn't quite as relaxing as it first seems. It's not long before the score targets become more demanding, and you find yourself dragging each building across every inch of the map, nudging the scroll wheel and shifting the mouse gently to find the perfect spot. It can be a little pernickety about placement too, and you won't immediately know that certain buildings can't be placed on certain surfaces, though that's a mistake you'll only make once. Otherwise, this is wonderfully absorbing stuff. Modest but ingenious and smartly priced.

■ APC team

Verdict

Engaging to tinker with as a palate cleanser between bigger games.

★★★★☆

US$34.99 | PC, PS4, XB1 | WWZGAME.COM

World War Z

Surely we have reached peak zombie?

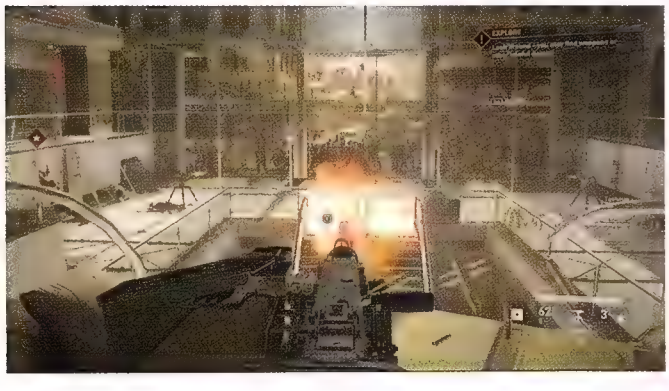
Here's a fourplayer co-op shooter which throws hordes and 'specials' at you while you navigate episodic scenes from after the global pandemic turns our familiar world into one of smashed glass, police barricades and viscera. The only real nods to the book and film of the same name are incidental – places, names, and that unnerving way its zombies pile up on each other to climb sheer walls.

Conceptually, it's *Left 4 Dead 3*. Stylistically and creatively, however, it's closer to *Left 4 Dead 2.1*. The mowing down of reanimated corpses takes place across New York, Jerusalem, Tokyo and Moscow, each comprising three sequential levels. It's within these locations, however, that the most profound problem with *World War Z* lies: levels are too short. They're even more noticeably lacking in spectacle, imagination or surprise. Despite each location's visual flourishes and incidental details, every mission involves the same prosaic treks from A to B. Punctuated only by stationary defence sequences like those at the end of each *Left 4 Dead* episode, they quickly begin to feel like cardboard cutouts arranged into film sets.

One escape through the New York subway system is very much like another. Whatever special infected variants crop up, you never break stride. And because of that, your adventures conclude without any standout moments in your mind. Shooting the undead feels just as it should, all heavy impacts and lolloping limbs when you pull the trigger. Those pyramid moments, when your enemies arrange themselves into the most satisfying target imaginable, are delivered gratuitously.

World War Z wants you to play it again and again. It plans on you growing in competency, upping the difficulty, unlocking perks and learning which classes work best together. But without having nailed its own USP you're far more likely to be reminded of how fantastic *Vermintide* and *Left 4 Dead* are, and play them instead.

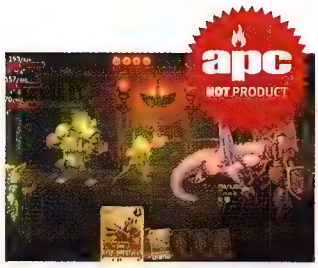
■ APC team



Verdict

A competent zombiefest, but better choices are plentiful.

★★★☆☆



SteamWorld Quest: Hand of Gilgamech

No bull.

$32 | SWITCH | IMAGEFORM.SE

Image & Form's card-based RPG is worthy of praise for making every battle count. Even the rank and file can present a test. For once, you can't afford underestimate the underlings; rather than resorting to failsafe tactics, you need to actually think about your next move. In large part, it achieves this by being strict. At times, its limitations can seem severe: a miserly three cards per turn? Only eight per character? The *SteamWorld* games are all about making complex genres accessible, but this is ridiculous. Except it really isn't. After a while, you'll have so many possible options that the choice becomes overwhelming – but it also means you have different ways and means of getting around every obstacle. Try as you might to build a balanced deck, you'll always find an opponent you scrape past by the skin of your teeth, at which point you'll know it's time to shuffle the pack. *SteamWorld Quest* gets a lot of unglamorous stuff right: it's well-paced, exquisitely balanced, challenging but fair, doesn't outstay its welcome and has a battle system you'll be thinking about when you're not playing. ■ APC team

★★★★½

Far Cry games are highly regarded for both their lush natural settings, and well crafted characters

The Crying Games

Back in 2004, an unknown German developer exploded onto the gaming scene with a 3D engine that could finally challenge Epic and ID. The result was *Far Cry*, a game that spawned two very different, yet inextricably linked, franchises.

GAMES: *Far Cry* series / Crysis series
DEVELOPER: Ubisoft Montreal / Crytek
PERSONALITIES: Cevat Yerli, Anvi Yerli, Faruk Yerli, Turko-German game developers generally, Ubisoft as a gestalt
RELEASED: *Far Cry*: 2004-2018 / *Crysis*: 2007-2013
NUTSHELL: Open world shooters that initially pushed hardware to the limit and showed us what a true "next generation" PC game could be, but were progressively dumbed-down to make bigger bucks from the console markets.

By the early 2000s, PCs had finally reached a point where gamers could expect truly huge worlds in their games. *Morrowind* came out in 2002. So did *Grand Theft Auto III*. *World of Warcraft* was 2004.

But these games had a very particular graphical limitation: their engines could only really render an area close around the player. The worlds were perpetually shrouded in fog. There was no "far green country under a swift sunrise" as some old wizard might have said. *GTA3* actually did a pretty good job of things by limiting the amount of places the player could even see that far, but when you hit the water and stole a police boat out by the pier on Staunton Island, the hills in the far distance were little more than grey triangles.

Far Cry not only rendered amazing detail at far distances (get it now?), it had dynamic level-of-detail capabilities that allowed the player to use binoculars or the scope on a sniper rifle to clear out an enemy encampment from the next hill.

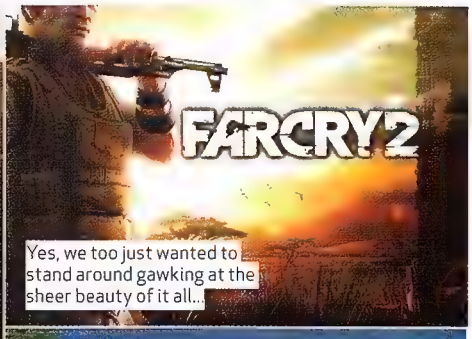
That might not sound particularly amazing in 2019, but in 2004 it was a revelation. The euphoria of which was blunted somewhat by the subsequent revelation that *Far Cry* wasn't that good a game.

To be fair to Crytek, *Far Cry* was born from a tech demo they'd made called *X-Isle: Dinosaur Island*, and (though they've never confirmed this) the idea seemed to be that Crytek and its CryEngine would be, much like Epic was for some years, first and foremost a middleware developer.

And indeed the company has gone on to be just that. After *Far Cry*, CryEngines 2, 3, 4, CryEngine (sic), and CryEngine V (also sic) have been licensed to create games you've heard of like *Prey*, and a lot of games you probably haven't heard of like *Winning Putt*, *Robinson: The Journey*, and a bunch of titles

Far Cry 2's African setting brought an exciting new locale to gaming

Far Cry wasn't afraid to go well off gaming's beaten track



Yes, we too just wanted to stand around gawking at the sheer beauty of it all...

Who can forget the glorious opening scene in *Far Cry*.

whose websites don't even work.

But back in 2004, or I suppose a year or so earlier, Ubisoft took one look at that *X-Isle* demo and said "Yes please! Can you make a whole game from this?" And the team at Crytek looked at each other and shrugged. Sure they could make a whole game from their tech demo. What do gamers like? Hot chicks who turn out to be CIA agents, a badass dude "hiding" in the jungle while wearing a bright-red Hawaiian shirt, and abandoning the whole stealth-optional mercenary hunting framework for blasting away at enormous mutant gorillas towards the end of the game. Right?

Perhaps most oddly, the game's weapons were intricately rendered (by 2004 standards) with full details like iron sights, but the actual game didn't let you hold the weapon up in a way to let you use those iron sights. That was added later by modders.

But come on. So what if *Far Cry* wasn't the greatest open world shooter ever? It showed amazing promise, and at the time we couldn't wait to see what Ubisoft and Crytek would do next.

CHICKEN TO THE FACE

And so of course the two companies immediately parted ways. Crytek went off to crunch literally a million lines of code into *Crysis*, and Ubisoft was left with a licensed version of the original engine – now called Dunia – and the *Far Cry* IP.

Now the world had two "Far Cry engine" developers, in direct competition, and we waited to see what would happen with bated breath.

First out of the gate was Crytek's *Crysis*. The name was a compromise because they didn't own *Far Cry* anymore, but the game, which dropped in late 2007, was... something else. The CryEngine 2 on which it ran was compiled from literally a million lines of code, and had texture data measured in the gigabytes. All perfectly normal... for a game released ten years later.

Hilariously, *Crysis* suffered from almost exactly the same problems as *Far Cry*: the first two thirds of the game were an amazing open FPS, where you could approach each target from any of a dozen different ways. This was mostly thanks to the player's Nanosuit, which had "modes" like

ENDURING LEGACY

For something like a decade, the phrase "but can it run *Crysis*?" was the standard gag response to anyone boasting about the power of their PC. *Crysis* became PC's answer to the Mac's "sure those are good graphics, but did you ever play *Myst*?" except, you know, *Crysis* actually had good realtime graphics.

The *Crysis* nanosuit was itself a game mechanic offering varied play styles.

"*Far Cry 2* was in many ways as much of a tech demo as *Far Cry*. The team at Ubisoft Montreal almost seemed to take *Crysis* as a challenge. Okay sure, maybe their game didn't look as amazing, but they made it do way more clever stuff."

stealth, power-up, high jump etc that could be selected with a hotkey and flick of the mouse.

When we got the review code, which was back when I was the editor of *PC PowerPlay* I played the opening level, "Contact", about ten times, just seeing all the different ways I could take down the soldiers camping on the beach. Yes, chickens and crabs were eventually hurled.

And yet the back third of the game was rubbish. Aliens, corridor shooting, no options or freedom, terrible frame-rates due to object complexity, and a by-the-numbers big boss fight right at the end. Oh well, at least the graphics were still awesome.

After splitting with Ubisoft, Crytek developed its own games using *Far Cry* technoilogy, including *Ryse: Son of Rome*.

IT BEGAN IN AFRICA-CA-CA-CA...

Meanwhile, obviously, Ubisoft couldn't possibly create a game even as good as *Far Cry* – let alone *Crysis* – without the coding genius of Cevat Yerli and his brothers, and their Teutonic work ethic. Which is why in 2008, *Far Cry 2* turned out to be kind of brilliant?

It was set in Africa, the map was huge, and the world did real stuff. Set fire to a tree and it would burn into a blackened skeleton, while the fire spread through the dry grass around it. Firing a rocket launcher with a bunch of dry grass behind you would set you on fire. Enemy soldiers would apply first aid to their injured comrades, or try to carry them off the battlefield. You could shoot people through flimsy corrugated iron shacks. You could shoot branches off trees.

Far Cry 2 was in many ways as much of a tech demo as *Far Cry*. The team at Ubisoft Montreal almost seemed to take *Crysis* as a challenge. Okay sure, maybe their game didn't look as amazing, but they made it do way more clever stuff.

And the story was like almost nothing we've seen since. You're sent in to a Central African nation with a simple mission: kill the terrorist known as the Jackal. What follows is basically a potboiler espionage novel (with brains) that follows the collapse of a country from "unrest" into "civil war" and eventually "pure anarchy".

It seems hard to imagine that *Far Cry 2* could get made today. The game was more *ARMA* than *Call of Duty*. You had to drive around a lot. The interface was in the world – to examine a map, you literally pull a map out of your pocket.

Shot? Dig a knife into the would to

extract the bullet. Bit by a snake? Dig a knife into the wound to extract the bullet. Need to heal fall damage? Dig a knife into... well you get the point. It wasn't perfect.

But *Far Cry 2* was amazing and we couldn't wait to see what *Far Cry 3* would bring.

WELCOME TO THE MAINSTREAM

So what happened of course, to both the *Far Cry* and *Crysis* franchises, was console sales. Consoles in the early 2010s didn't have the power to procedurally burn trees that you could also shoot branches off. And console players – no disrespect – didn't want a "thinking gamer's shooter". For the growing console user base, a shooter was something to do at the end of the day, to unwind after a crushing ten hours in corporate whatever. BLAM BLAM BLAM. Don't ask them to think about it, to plan a stealthy approach, to modify weapons, or – least of all – tolerate realistic gun jamming like in *Far Cry 2*.

The accusation "dumbed down for console" is made with fairly reckless abandon but it really does stick to *Far Cry 3*, *4*, and *5* and *Crysis 2* and *3*.

Probably, *Far Cry* did the better job of it. *Far Cry 3* is not as smart or complex as *Far Cry 2*, but it's still a fairly sophisticated open world shooter. *Far Cry 4* has some interesting story beats, and both it and *Far Cry 5* have wink-to-the-open-world-superfans secret endings you get right at the beginning by doing... nothing. Seriously, if you just stand there for a few minutes, the game ends.

Crytek approached its two final *Crysis* games with a truly bizarre mission statement: they would leave behind the "literal jungle" setting of *Far Cry* and *Crysis*, and instead focus on the super-original "concrete jungle" setting of... bloody Manhattan again.

And in *Crysis 3*, because aliens, New York had also become sort of half a literal jungle, too.

The last two *Crysis* games again did significant things for the advancement of FPS engine tech. They run fast and look good, and are much less punishing than the original. But they aren't great games.

YOU CAN LEAD A GAMER TO CRYSIS...

Maybe Crytek was never that good at actual game design. But with *Far Cry 2* in its back catalogue, Ubisoft has no similar excuse.

It's almost as if they realised that a true open world game, with true late-90s complexity (see last issue's Game Changer trip with *Jagged Alliance*) but 2010s graphics, was just too much game for the majority of gamers.

Crysis 3's astonishingly beautiful ice levels taxed PC hardware severely at the time.

Crytek CEO Cevat Yerli at Gamescom 2009.

You, the PC gamer, will always shout "more! more!" and demand harder, more complex games.

But most people just can't handle them, just don't want to handle them. To the mass audience, a "complex and difficult" game is something like *Sekiro*. Which sure, is hard, but you're still just one guy hitting other guys with a stick.

Maybe there's hope, though. Crytek came from nowhere and made *Crysis*, and that led to *Far Cry 2*. So who's to say it won't happen again?

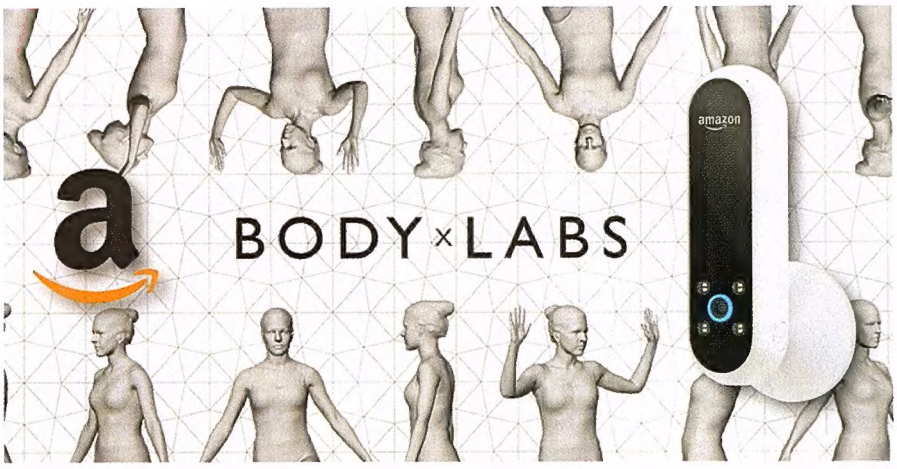
Our advice? If you're ever browsing Kickstarter and you see an open-world full-simulation shooter that tasks you with manipulating the political factions of a disintegrating country to wipe each other out while you help all the civilians escape... *back it*.

THE REAL WINNERS?

From this article, you might think Crytek's decision to dump Ubisoft and go it alone (ie with EA, THQ, and various others), wasn't exactly genius.

But even as it was releasing underwhelming *Crysis* sequels (and *Ryse: Son of Rome* – remember that one?), Crytek was doing deals and licensing its engine. Eventually, they scored the big one: Amazon picked up CryEngine in 2015 as the core of its Lumberyard cross-platform general purpose 3D engine. It's "free" to you, but it integrates with Amazon Web Services, and you can bet your last obsolete German mark that Crytek, as a result of this deal, is now set for life. ■

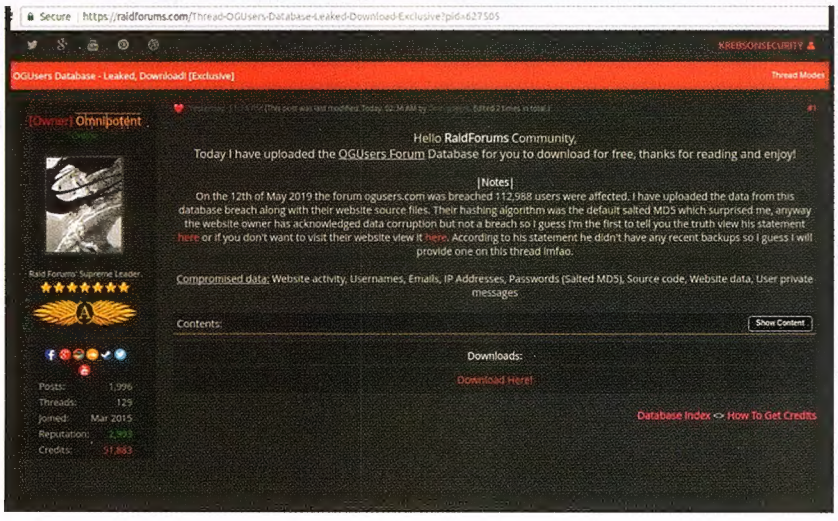
» JOEL BURGESS REPORTS ON THE UNUSUAL SIDE OF TECH NEWS.



Amazon trades gift cards for permanent 3D body scans

Online shopping giant wants to use your body shape to shape spending habits.

Amazon is giving users US$25 gift cards in exchange for volunteering 3D scans of their body to the online shopping giant. While some of us may think that $25 isn't a bad price for a few 3D images, the fine print also requires videos and pictures in 'form-fitting' swimsuits. Amazon's 'offer' notes that the material will be used "exclusively for internal product research", so you're unlikely to see your shape appearing in marketing materials. However, given recent reports that Amazon gave thousands of employees open access to customers private Alexa recordings for 'training purposes', we'd suggest caution before sending any pics of yourself in your tighty-whities to a big tech company.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|Notes|
On the 12th of May 2019 the forum ogusers.com was breached 112,988 users were affected. I have uploaded the data from this database breach along with their website source files. Their hashing algorithm was the default salted MD5 which surprised me, anyway the website owner has acknowledged data corruption but not a breach so I guess I'm the first to tell you the truth view his statement here or if you don't want to visit their website view it here. According to his statement he didn't have any recent backups so I guess I will provide one on this thread lmfao.
Compromised data: Website activity, Usernames, Emails, IP Addresses, Passwords (Salted MD5), Source code, Website data, User private messages
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Posts: 1,996
Threads: 129
Joined: Mar 2015
Reputation: 2,993
Credits: 51,883

Legendary hacking forum gets pwned

HACKERS' EMAILS, PASSWORDS AND MESSAGES DIVULGED BY THE COMPETITION.

Notorious online hacking forum ogusers.com, which trades tips on topics like 'hijacking online accounts' and 'SIM swapping', was itself breached in May according to KrebsonSecurity, exposing the email addresses, hashed passwords and messages of its 113,000 users. The administrator of a competing hacker forum, RaidForums, posted that they had breached ogusers.com, stolen its chat history and uploaded the site's database and source files to its own forum. Needless to say, this caused a lot of anxiety for 'users' in the 'MAKE OGU GREAT AGAIN' Discord channel, who complained about receiving phishing emails and commented "i [sic] lost all of my rep because of the setback" and "it's like 9/11 all over again".

Application Offline
Due to the ransomware attack on the City's computer system, the City's online payment portal is currently not operational.
While this matter is being addressed, customers may bring payments along with bills/statements to the Municipal Building located at 200 Holliday Street.
Payments can also be sent by postal mail. Please use only checks or money orders.
Any late fees and penalties related to this payment system will be waived beginning with the date of May 7 and such fees will remain waived until the online payment system is operational.
Thank you for your patience as we work to restore normal operations.

Baltimore city hacked using NSA tool

CITY RANSOMWARE CASE WILL LIKELY COME DOWN TO THE WIRE.

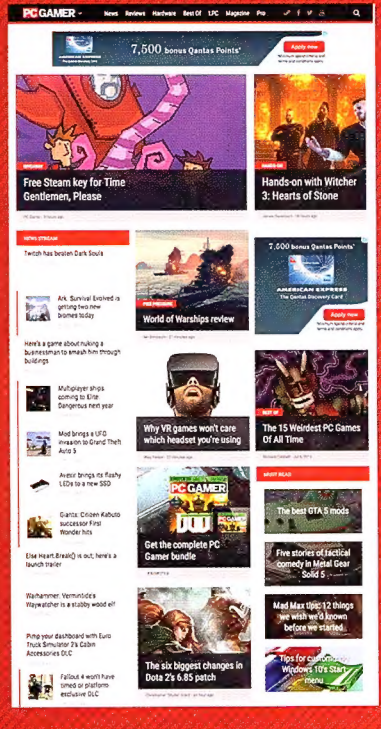
At the beginning of May, the Baltimore city government suffered a devastating cyberattack that has left officials without email and residents without the ability to pay water bills, purchase homes or access other government services. The ransomware was added to the network using an exploit known as EternalBlue, a tool that, ironically, was developed by the US government's own National Security Agency (NSA), and which allows external parties to execute remote commands on some versions of Windows XP and Vista. At the time of writing, the city mayor said he was not inclined to pay the US$76,000 ransom being demanded, and was instead using offline workarounds for government services like processing property sales.

PC 'artwork' riddled with malware sells for over US$1.3 million

WORLD'S LEAST-APPEALING PC SELLS AT A HIGH PREMIUM.

While there seems to be constant debate over whether computer games can be considered art, it's rare to hear the same claim being made about computer viruses. Well, according to internet artist Guo O Dong, they absolutely can – and Dong has auctioned off a laptop for the artful sum of US$1.34 million to prove it. Dubbed *The Persistence of Chaos*, the unusually bloated PC contains six of the world's most prolific pieces of malware, which are collectively accountable for an estimated US$95 billion in economic damage. The artwork sold just prior to this issue going to print, so some lucky bugger will be receiving this self inflicted phishing attack soon. Don't fret if you missed out though – you can likely pick up the software for free just by searching your favourite piracy sites. ■

SMARTER COOKIES ENABLED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